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CONCEPTUAL DESIGN STUDY

OF

1985 COMMERCIAL

TILT ROTOR TRANSPORTS

VOLUME IV - STOL SUBSTANTIATING DATA

D313-099-002

BELL HELICOPTER COMPANY

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TECHNICAL DATA

BY _K. W. Sambell_ _____ DATE _9-16-75_

CHECKED _____ DATE _____

APPROVED _J. A. DeTore_ _____ DATE _9-16-75_

APPROVED _____ DATE _____

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CONCEPTUAL DESIGN STUDY OF 1985
COMMERCIAL TILT-ROTOR TRANSPORTS

VOLUME IV
STOL SUBSTANTIATING DATA

PREPARED UNDER CONTRACT NAS2-8259

NOTICE

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FOREWORD

This report by the Bell Helicopter Company (BHC), Fort Worth, Texas, presents the STOL substantiating data of a conceptual design study of 1985 commercial tilt rotor V/STOL transports. Phase I, in Volumes I and II, presented the results of the VTOL portion of the study. Phase II, in Volumes III and IV, presents the STOL portion. The study is being conducted for the National Aeronautics and Space Administration, Ames Research Center, Moffett Field, California, under Contract NAS2-8259. Mr. D. R. Brown is the NASA Contracting Officer and Mr. H. K. Edenborough is the NASA Technical Monitor. Mr. K. W. Sambell is the BHC Project Engineer for the study.

The technical guidance of Mr. J. A. DeTore of BHC is especially noted. The assistance and advice of the following members of the BHC technical staff are gratefully acknowledged:

        Mr. B. D. Charles - Aero Acoustics
        Mr. R. D. Foster - Aerodynamics
        Mr. D. A. Hardesty - Handling Qualities
        Mr. E. E. Scroggs, Jr. - Weights
        Dr. J. G. Yen - Aeroelasticity

The BHC tilt rotor aircraft design synthesis methods, available for use on this project, were developed principally by Mr. E. L. Brown. The engine scaling methods were developed by Mr. F. V. Engle.

The volumes prepared are as follows:

    Volume I   - Conceptual Design Study of 1985 Commercial
                  Tilt-Rotor Transports - VTOL Design Summary
                  (BHC Report No. D312-099-002). NASA CR-2544

    Volume II   - Conceptual Design Study of 1985 Commercial
                  Tilt-Rotor Transports - VTOL Substantiating
                  Data (BHC Report No. D312-099-003). NASA
                  CR-137602

    Volume III - Conceptual Design Study of 1985 Commercial
                  Tilt-Rotor Transports - STOL Design Summary
                  (BHC Report No. D313-099-001).

    Volume IV   - Conceptual Design Study of 1985 Commercial
                  Tilt-Rotor Transports - STOL Substantiating
                  Data (BHC Report No. D313-099-002). NASA
                  CR-137765

TABLE OF CONTENTS

OUTLINE & SYMBOLS

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STOL SUBSTANTIATING DATA

OUTLINE OF VOLUME IV

Data resulting from the Bell Helicopter Company tilt-rotor
aircraft design synthesis computer program for four point-
design aircraft are compiled in this volume (BHC program
OMSW03).

The data are arranged for two payload categories: 100-
passenger and 45-passenger aircraft. For each payload cate-
gory, two point-designs are shown: a four-engine design and
a twin-engine design.

The four-engined aircraft were optimized for maximum fuel
economy at the fuel cost specified in the contract,
2.0 ¢/lb.

The twin-engined aircraft were optimized for minimum DOC at
a fuel cost, estimated as typical for 1980-1985, of 10.0 ¢/lb.

In each payload category, a common fuselage design is assumed
which is shown immediately preceding the data for that category.

The cost data shown on page 9 of each data set is based on an
airframe unit cost of $90 per pound and a utilization of 2500
block hours per year.

For the 100-passenger class four-engined aircraft, cost data
are presented on pages 9-A through 9-D for airframe unit costs
of $90 per pound, $110 per pound, and utilizations of 2500 and
3500 block hours per year.

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SYMBOLS

For each of the four point designs, the results of the synthesis
program are printed on a data set consisting of pages numbered
1 through 14.   The formats in each set are identical
for pages numbered the same.   Some of the pages have self-
explanatory nomenclature while others use symbols.   The
descriptions of the symbols for the appropriate data-set page
numbers are presented in this section.

The data set page numbers using symbols are listed below.
(Those pages using the same symbols are grouped on the same
line.)

        - Pages 1 through 6

        - Page 7

        - Page 8

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SYMBOLS FOR PAGES 1 THROUGH 6 OF EACH DATA SET:

NAME	DESCRIPTION	UNITS
ALPHA	Angle of attack of the fuselage waterline relative to freestream velocity	DEG
ALT	Pressure altitude	FT
BOOMS	Equivalent-flat-plate area of twin booms of a twin-boom tilt rotor configuration, not applicable in this study	FT2
CD	Drag coefficient of the airframe in airplane mode, referenced to aerodynamic wing area and freestream velocity	-ND-
CDF	Drag coefficient contribution of the fuselage	-ND-
CDH	Drag coefficient contribution of the horizontal stabilizer	-ND-
CDWP	Drag coefficient contribution of the wing and wing-tip-pods	-ND-
CL	Lift coefficient of the aircraft in airplane mode, referenced to aerodynamic wing area and freestream velocity	-ND-
CLH	Lift coefficient contribution of the horizontal including elevator trim	-ND-
CLPRP	Lift coefficient contribution of the proprotors due to thrust forces acting along mast centerlines	-ND-
CLWP	Lift coefficient contribution of the wing and wing-tip-pods	-ND-
DGW	Design gross weight of the aircraft	LBS
EXT	Equivalent-flat-plate area of landing gear pods in this study, also used for external stores when applicable	FT2
F	Equivalent-flat-plate area of the airframe	FT2
FF	Fuel flow of all operating engines, including percent increase in fuel flow if applicable	LB/HR

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SYMBOLS FOR PAGES 1 THROUGH 6 (CONTINUED)

NAME	DESCRIPTION	UNITS
FUS	Equivalent-flat-plate area of the fuselage at zero lift of the fuselage alone	FT2
GW	Gross weight of the aircraft	LBS
HOR	Equivalent flat plate area of the horizontal stabilizer at zero lift of the horizontal alone	FT2
INTMPA	Uninstalled intermediate power available of all operating engines at the engine output shafts, corrected for off-optimum-rpm operation, 30-minute rating not multiplied by the engine installation and accessory loss factor. Airplane mode.	HP
MISC	Equivalent flat-plate-area of miscellaneous items contributing to drag but not included in other component drag	FT2
MP	Proprotor figure of merit, referenced to proprotor shaft thrust and power required	-ND-
NAC	Equivalent-flat-plate area of the nacelles at the wing tips, also called wing-tip-pods	FT2
NORMPW	Uninstalled maximum continuous power available of all operating engines at the engine output shafts, corrected for off-optimum-rpm operation not multiplied by the engine installation and accessory loss factor	HP
OMGR	Proprotor rotational tipspeed	FT/SEC
PROPCD	Mean section profile-drag coefficient of the proprotor blades in airplane mode, based on F35 calculations	-ND-
PROPCL	Mean section lift coefficient of the proprotor blades	-ND-
PROPNL, PROPN	Propulsive efficiency of the proprotor referenced to shaft thrust and power, level flight	-ND-
PROPNC	Propulsive efficiency of the proprotor referenced to shaft thrust and power, at stated rate of climb	-ND-

SYMBOLS FOR PAGES 1 THROUGH 6 (CONTINUED)

NAME	DESCRIPTION	UNITS
PWRCL	Climb-power-utilized of all operating engines, at the engine output shafts, divided by the engine accessory and installation loss factor	HP
PWREQD	Power required of all operating engines at the engine output shafts divided by engine installation and accessory loss factor	HP
Q LIMITED	Torque limited-- i.e., speed is limited by torque limit of drive system	-ND-
R/C	Rate of climb using either torque limited or intermediate power, whichever is less	FT/MIN
SFC	Specific fuel consumption referenced to PWREQD and corrected for off-optimum-rpm operation	LB/HP-HR
SL	Sea level	-ND-
TC	Proprotor thrust coefficient referenced to proprotor shaft thrust, and proprotor solidity using blade chord outboard of 25-percent radius, $2 C_T/\sigma$	-ND-
TEMP	Atmospheric temperature	DEG
THPAP	Thrust horsepower available from both rotors, at intermediate rated power of all operating engines, and level flight propulsive efficiency	HP
THPAQ	Thrust horsepower available from both rotors at the maximum proprotor shaft power permitted by the drive system torque limit, for the level flight propulsive efficiency	HP
THPR	Thrust horsepower required from both rotors in steady-state level-flight, zero rate of climb	HP
UTLHP	Maximum continuous power permitted of all operating engines by drive system torque limit, at the engine output shafts, divided by the engine installation and accessory loss factor	HP

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SYMBOLS FOR PAGES 1 THROUGH 6 (CONCLUDED)

NAME	DESCRIPTION	UNITS
VERT	Equivalent-flat-plate area of the vertical stabilizer	FT2
V	True airspeed	KNOTS
VGND	Ground speed	KNOTS
VMC	Maximum continuous true airspeed	KNOTS
VMCX	Maximum continuous true airspeed at sea level standard day	KNOTS
WING	Equivalent-flat-plate area of the wing at zero lift of the wing alone	FT2

SYMBOLS FOR PAGE 7

NAME	DESCRIPTION	UNITS
ACL	Rate of climb in airplane mode with all engines operating, at either torque-limit or intermediate power whichever is less.	FT/MIN

Rate of climb is given in the table for
each of four gross weights, and for alti-
tudes delineated by the major headings
numbered 1 through 5 above the FF1 columns.
The specific altitudes corresponding to
these headings are in this order - 0, 5000,
10000, 15000, and 20000 feet. The table is
further divided by two subheadings numbered
1 and 2, for each altitude. Under subhead-
ing 1, climb is given at the true airspeed
for minimum power (maximum rate of climb)
which is taken as $1.2 \times V_{stall}$ based on results
of prior calculations. Under subheading 2,
it is given at that airspeed times a factor
(such as 1.5) which is a variable input to
the program. All climb data are standard
day.

NAME	DESCRIPTION	UNITS
ACR	Fuel flow of all operating engines in airplane-mode level-flight-cruise or loiter, including percent increase in fuel flow if applicable (not used in this study).	LB/HR

Fuel
flow is given in the table for each of four
gross weights and for nine flight conditions
delineated by the headings 1 through 9 above
the V2 and ACR columns. Although each condi-
tion is for but one specific altitude and
atmospheric temperature, the altitude may be
different for various cases provided it falls
within the limits given below. To find the
specific altitude within these limits, it is
presently necessary to cross reference the
data on pages 2 through 7. If the values of
ACR are zero, then fuel flow data for that
flight condition were not needed for the mis-
sion calculations and were not calculated.
The condition descriptions given below are
not the only ones permitted by program logic,
but they have been consistently used for this
study, to date.

Condition	Description
1	Cruise at true airspeed for 99-percent maximum-nautical-miles per pound-of-fuel at one specific

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SYMBOLS FOR PAGE 7 (CONTINUED)

NAME   DESCRIPTION   UNITS

              Condition   Description

                           altitude which must be within
                           5000 to 9999 feet, standard day

              2   Cruise at true airspeed for 99-
                           percent maximum-nautical-miles
                           per pound-of-fuel at one specific
                           altitude which must be within
                           10000 to 14499 feet, standard day

              3   Cruise at the true airspeed for
                           99-percent maximum-nautical-miles
                           per pound-of-fuel at one specific
                           altitude which must be within
                           15000 to 19999 feet, standard day

              4   Cruise at the true airspeed for
                           99-percent maximum-nautical-miles
                           per pound-of-fuel at one specific
                           altitude which must be within
                           20000 to 24999 feet, standard day

              5   Cruise at either 90-percent maxi-
                           mum continuous power or at torque-
                           limit power whichever is less, at
                           one specific altitude which must
                           be within 10000 to 14999 feet,
                           standard day

              6   Cruise at either 90-percent maxi-
                           mum continuous power or at torque-
                           limit power whichever is less, at
                           one specific altitude which must
                           be within 15000 to 19999 feet,
                           standard day

              7   Cruise at either 90-percent maxi-
                           mum continuous power or at torque-
                           limit power whichever is less, at
                           one specific altitude which must
                           be within 20000 to 24999 feet,
                           standard day

              8   Cruise, loiter, or hold in airplane
                           mode at the true airspeed for mini-
                           mum fuel flow but not less than 1.2
                           x V_{stall}, at one specific altitude
                           which must be within 5000 to 9999
                           feet, standard day

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SYMBOLS FOR PAGE 7 (CONTINUED)

NAME	DESCRIPTION	UNITS

Condition	Description

9   Cruise, loiter, or hold in airplane mode at the true airspeed for minimum fuel flow but not less than 1.2 x V_{stall} at one specific altitude which must be within 0 to 4999 feet, standard day

FF1   Fuel flow in climb for ACL. See definition of ACL   LB/HR

GW1   Gross weight of the aircraft   LBS

HOV   Fuel flow in out-of-ground effect hover with all engines operating. Fuel flow is given for each of four gross weights and for three flight altitude and atmospheric temperature combinations as delineated by headings 1 through 3 beneath the HOV label. The three combinations are in this order: altitude = 0 and temperature = 90°F; altitude = 0 and temperature = 59; altitude = 3000 feet and temperature = 91.5. If values of HOV are zero, then the calculation of fuel flow for that condition was not requested in the program input and should not be included in the mission analysis   LB/HR

V2   Cruise airspeeds for ACR, true airspeed. (See definition of ACR)   KNOTS

V3   Climb airspeeds for ACL, true airspeed. (See definition of ACL)   KNOTS

WFF   Fuel flow with all engines operating, at a predetermined percentage of maximum continuous power, and at hover tipspeed and zero airspeed of the aircraft. Fuel flows are shown in the table for five combinations of altitude and temperature as given below. Although all are routinely calculated, only the third value from the top of the column is used in this study. The five combinations and the related power are as follows   LB/HR

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SYMBOLS FOR PAGE 7 (CONCLUDED)

NAME	DESCRIPTION			UNITS
	ALTITUDE/FT	TEMPERATURE/$^\circ$F	MAX. CONT. POWER/%	
	0	90	100	
	3000	91.5	100	
	0	59	50	
	0	95	100	
	3000	91.5	*	

* Intermediate rated power, but SFC at
maximum continuous power

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SYMBOLS FOR PAGE 8

NAME	DESCRIPTION	UNITS
D	Accumulated distance	N. MI.
FR	Accumulated fuel required	LBS
H	Altitude	FT
MODES	ACL – Airplane Climb ACR – Airplane Cruise ALO – Airplane Loiter DSC – Descent (previous mode and speed) GND – Ground HOV – Hover TOF – STOL Takeoff WUP – Warmup	–ND–
T	Accumulated time	HRS
V	True airspeed	KNOTS
W	Gross weight	LBS
WP	Weight of payload plus crew	LBS

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SUBSTANTIATING DESIGN SYNTHESIS DATA

FOR FOUR POINT DESIGNS

DIMENSIONS FOR 100-PASSENGER FUSELAGE   100 PAX

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D313-099-002

100 PASSENGER FUSELAGE

PASSENGER PAYLOAD = 18,000 lbs
(SEE Pg 13)

PASSENGER CABIN (570")

FUSELAGE STATIONS (IN.)

B.L. BUTTOCK LINES (IN.)

100 PAX
4 ENG

D313-099-002

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DESIGN SYNTHESIS PROGRAM

DESIGN POINT NUMBER 2
DGW = 64300

COMPONENT ZERO-LIFT DRAG, AIRPLANE, FLAPS UP

WING	HOR	VERT	FUS	NAC	BOOMS	EXT	MISC	TOTAL
6.95	2.29	1.78	10.62	3.42	0.00	2.00	0.00	27.07

DRAG WITH LIFT, AIRPLANE, FLAPS UP

ALPHA	CL	CD	CLWP	CLH	CLPRP	CDWP	CDF	CDH
-4.00000	-0.18452	0.03756	-0.07022	-0.11168	-0.00263	0.01188	0.01659	0.00482
-2.00000	0.02243	0.03328	0.10532	-0.08173	-0.00116	0.01210	0.01313	0.00378
0.00000	0.22909	0.03388	0.28086	-0.05177	0.00000	0.01458	0.01197	0.00307
2.00000	0.43595	0.03936	0.45640	-0.02182	0.00137	0.01930	0.01313	0.00267
4.00000	0.64355	0.04973	0.63194	0.00813	0.00348	0.02627	0.01659	0.00260
6.00000	0.85239	0.06497	0.80748	0.03808	0.00683	0.03550	0.02237	0.00285
8.00000	1.06301	0.08510	0.98302	0.06804	0.01196	0.04697	0.03045	0.00342
10.00000	1.27596	0.11011	1.15856	0.09799	0.01942	0.06069	0.04085	0.00431
12.00000	1.49179	0.14000	1.33409	0.12794	0.02976	0.07666	0.05355	0.00552
14.00000	1.71510	0.17477	1.50963	0.15789	0.04358	0.09488	0.06857	0.00706

SPEED POWER DATA-AIRPLANE

GW	=	64300	ALT=	0	TEMP=	59	OMGR=	600		
V	=	136.7	156.7	176.7	196.7	216.7	236.7	256.7	276.7	296.7	316.7
ALPHA	=	8.781	6.187	4.405	3.132	2.193	1.480	0.927	0.489	0.136	-0.151

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                BELL  HELICOPTER  COMPANY                                          PAGE   2
                DESIGN SYNTHESIS PROGRAM                                           DATE 06/12/75
                                              DESIGN POINT NUMBER  2
CL     =   1.146  0.872  0.686  0.553  0.456  0.383  0.325  0.280  0.243  0.213
CD     =  0.0943 0.0666 0.0524 0.0446 0.0401 0.0375 0.0358 0.0348 0.0341 0.0337
F      =   84.6   59.5   46.6   39.6   35.6   33.2   31.8   30.8   30.7   29.9
PROPCL=  0.0906 0.0805 0.0771 0.0780 0.0816 0.0871 0.0939 0.1016 0.1100 0.1189
PROPCD=  0.0098 0.0103 0.0108 0.0112 0.0116 0.0119 0.0121 0.0124 0.0128 0.0132
PROPN  =   78.3   76.6   75.8   75.7   76.1   76.8   77.6   78.3   78.7   79.1
PWREQD=    3033   3281   3729   4379   5236   6309   7611   9169  11024  13172
UTLHP =    7162
NORMPW=    8450   8525   8606   8692   8779   8865   8958   9067   9200   9359
L/D    =    8.9    9.4    9.3    8.9    8.2    7.4    6.7    6.0    5.3    4.7
SFC    =  0.5360 0.5166 0.4895 0.4635 0.4410 0.4206 0.4082 0.3994 0.3940 0.3909
FF     =    1625   1695   1826   2030   2309   2654   3107   3661   4343   5149
VMC=0 LIMITED
VMCX   =  246.7
FF     = 2867.0

SPEED POWER DATA-AIRPLANE
GW     =  80375  ALT=   5000  TEMP=     41  OMGR=    540
V      =  164.6  184.6  204.6  224.6  244.6  264.6  284.6  304.6
ALPHA  =  8.781  6.559  4.941  3.730  2.801  2.073  1.492  1.021
CL     =  1.146  0.911  0.742  0.615  0.519  0.443  0.383  0.335
CD     = 0.0943 0.0701 0.0563 0.0480 0.0429 0.0397 0.0375 0.0361
F      =   84.6   62.6   50.1   42.7   38.1   35.2   33.3   32.0
PROPCL= 0.1481 0.1316 0.1236 0.1211 0.1225 0.1265 0.1323 0.1395
PROPCD= 0.0109 0.0113 0.0117 0.0120 0.0122 0.0124 0.0127 0.0131
PROPN  =   85.4   83.8   82.5   81.8   81.5   81.5   81.5   81.3
PWREQD=    4186   4452   4926   5604   6484   7581   8917  10534
UTLHP =    6446
NORMPW=    7545   7624   7707   7789   7877   7974   8086   8218
L/D    =    9.7   10.2   10.2    9.9    9.3    8.6    7.9    7.1
SFC    = 0.4473 0.4395 0.4285 0.4193 0.4139 0.4084 0.4060 0.4056
FF     =   1872   1957   2111   2350   2684   3096   3620   4273

SPEED POWER DATA-AIRPLANE
GW     =  64300  ALT=   5000  TEMP=     41  OMGR=    540
V      =  147.3  167.3  187.3  207.3  227.3  247.3  267.3  287.3  307.3  327.3
ALPHA  =  8.781  6.341  4.624  3.374  2.436  1.715  1.149  0.697  0.330  0.028
CL     =  1.146  0.888  0.709  0.578  0.481  0.406  0.348  0.301  0.263  0.232
CD     = 0.0943 0.0681 0.0540 0.0460 0.0412 0.0383 0.0364 0.0352 0.0344 0.0339
F      =   84.6   60.7   48.0   40.8   36.6   34.0   32.3   31.3   30.6   30.1
PROPCL= 0.1232 0.1090 0.1032 0.1026 0.1055 0.1108 0.1178 0.1258 0.1347 0.1443
PROPCD= 0.0104 0.0109 0.0113 0.0117 0.0120 0.0122 0.0124 0.0127 0.0132 0.0141
PROPN  =   83.2   81.5   80.3   79.8   79.7   80.0   80.4   80.7   80.7   80.2
PWREQD=    3074   3302   3715   4315   5101   6081   7270   8696  10403  12443
UTLHP =    6446
NORMPW=    7481   7555   7635   7717   7800   7889   7987   8102   8237   8386
L/D    =    9.5   10.0    9.9    9.5    8.8    8.0    7.3    6.5    5.8    5.2
SFC    = 0.4835 0.4715 0.4560 0.4401 0.4241 0.4150 0.4091 0.4055 0.4051 0.4066
FF     =   1486   1557   1694   1899   2163   2524   2974   3526   4214   5059

SPEED POWER DATA-AIRPLANE
GW     =  48225  ALT=   5000  TEMP=     41  OMGR=    540
V      =  127.5  147.5  167.5  187.5  207.5  227.5  247.5  267.5  287.5  307.5  327.5
ALPHA  =  8.781  6.036  4.196  2.906  1.968  1.266  0.726  0.303 -0.036 -0.310 -0.536
CL     =  1.146  0.856  0.664  0.530  0.433  0.360  0.304  0.260  0.225  0.197  0.174
CD     = 0.0943 0.0653 0.0510 0.0435 0.0392 0.0368 0.0353 0.0344 0.0338 0.0335 0.0332
F      =   84.6   58.2   45.4   38.6   34.8   32.6   31.3   30.5   30.0   29.7   29.5
PROPCL= 0.0964 0.0850 0.0816 0.0831 0.0877 0.0943 0.1023 0.1113 0.1209 0.1311 0.1415
PROPCD= 0.0099 0.0104 0.0109 0.0113 0.0117 0.0120 0.0124 0.0127 0.0132 0.0141
PROPN  =   79.5   77.8   76.9   76.8   77.2   77.9   78.7   79.5   80.1   80.2   79.9
PWREQD=    2089   2277   2625   3137   3818   4674   5714   6958   8434  10187  12270
UTLHP =    6446
NORMPW=    7415   7482   7556   7636   7718   7802   7890   7989   8104   8239   8389
L/D    =    9.0    9.6    9.4    8.8    8.0    7.2    6.4    5.7    5.0    4.5    4.0
SFC    = 0.5622 0.5415 0.5106 0.4771 0.4512 0.4307 0.4166 0.4102 0.4054 0.4048 0.4060
FF     =   1175   1233   1340   1497   1723   2013   2381   2854   3419   4124   4981

SPEED POWER DATA-AIRPLANE
GW     =  32150  ALT=   5000  TEMP=     41  OMGR=    540
V      =  104.1  124.1  144.1  164.1  184.1  204.1  224.1  244.1  264.1  284.1  304.1  324.1
ALPHA  =  8.781  5.560  3.563  2.244  1.329  0.668  0.176 -0.200 -0.494 -0.728 -0.917 -1.073
CL     =  1.146  0.806  0.598  0.461  0.366  0.298  0.247  0.208  0.178  0.154  0.134  0.118
CD     = 0.0943 0.0612 0.0470 0.0404 0.0370 0.0352 0.0342 0.0336 0.0333 0.0331 0.0330 0.0330
F      =   84.6   54.5   41.8   35.5   32.8   31.2   30.3   29.8   29.5   29.4   29.3   29.2
PROPCL= 0.0674 0.0593 0.0587 0.0624 0.0687 0.0766 0.0857 0.0955 0.1058 0.1164 0.1273 0.1384
PROPCD= 0.0092 0.0097 0.0103 0.0108 0.0112 0.0116 0.0119 0.0122 0.0123 0.0126 0.0131 0.0139
PROPN  =   72.5   70.9   70.9   72.0   73.4   74.9   76.3   77.6   78.8   79.6   80.0   79.9
```

DESIGN POINT NUMBER 2

PWREQD=	1248	1394	1671	2084	2642	3355	4234	5288	6536	8008	9744	11799
UTLHP =	6446											
NORMPW=	7346	7404	7470	7543	7622	7704	7787	7874	7971	8083	8215	8362
L/D =	8.2	8.8	8.5	7.8	6.9	6.0	5.2	4.6	4.0	3.5	3.1	2.7
SFC =	0.7001	0.6645	0.6142	0.5590	0.5077	0.4658	0.4399	0.4205	0.4119	0.4058	0.4048	0.4052
FF =	873	926	1027	1165	1341	1563	1863	2224	2692	3250	3944	4781

SPEED POWER DATA-AIRPLANE
GW = 80375   ALT= 2000   TEMP= 52   OMGR= 540

V =	157.4	177.4	197.4	217.4	237.4	257.4	277.4	297.4	317.4
ALPHA =	8.781	6.473	4.815	3.587	2.653	1.927	1.352	0.888	0.510
CL =	1.146	0.902	0.728	0.601	0.504	0.428	0.369	0.321	0.282
CD =	0.0943	0.0693	0.0554	0.0472	0.0422	0.0391	0.0371	0.0357	0.0348
F =	84.6	61.8	49.3	41.9	37.5	34.7	32.9	31.7	30.9
PROPCL=	0.1375	0.1220	0.1149	0.1133	0.1153	0.1198	0.1261	0.1337	0.1422
PROPCD=	0.0107	0.0111	0.0115	0.0119	0.0121	0.0123	0.0125	0.0129	0.0135
PROPN =	84.6	82.9	81.7	81.0	80.8	80.9	81.1	81.1	80.9
PWREQD=	4040	4312	4803	5508	6429	7575	8966	10638	12642
UTLHP =	6446								
NORMPW=	7993	8070	8153	8236	8319	8411	8516	8643	8791
L/D =	9.6	10.1	10.1	9.7	9.1	8.4	7.6	6.9	6.2
SFC =	0.4627	0.4545	0.4430	0.4288	0.4186	0.4134	0.4082	0.4075	0.4074
FF =	1869	1960	2127	2362	2691	3131	3660	4335	5151

SPEED POWER DATA-AIRPLANE
GW = 64300   ALT= 2000   TEMP= 52   OMGR= 540

V =	140.8	160.8	180.8	200.8	220.8	240.8	260.8	280.8	300.8	320.8
ALPHA =	8.781	6.249	4.493	3.228	2.289	1.572	1.014	0.570	0.212	-0.081
CL =	1.146	0.878	0.695	0.563	0.466	0.392	0.334	0.288	0.251	0.221
CD =	0.0943	0.0672	0.0530	0.0452	0.0406	0.0378	0.0361	0.0349	0.0342	0.0338
F =	84.6	60.0	47.2	40.1	36.0	33.5	32.0	31.0	30.4	29.9
PROPCL=	0.1142	0.1009	0.0959	0.0960	0.0995	0.1053	0.1126	0.1209	0.1301	0.1398
PROPCD=	0.0102	0.0107	0.0111	0.0116	0.0119	0.0121	0.0123	0.0125	0.0129	0.0136
PROPN =	82.2	80.4	79.4	78.9	79.0	79.3	79.9	80.3	80.6	80.4
PWREQD=	2975	3209	3638	4261	5083	6111	7357	8847	10620	12729
UTLHP =	6446									
NORMPW=	7933	8006	8084	8167	8250	8334	8427	8536	8667	8818
L/D =	9.3	9.9	9.8	9.3	8.6	7.8	7.0	6.3	5.6	5.0
SFC =	0.5117	0.4959	0.4737	0.4533	0.4353	0.4205	0.4136	0.4080	0.4070	0.4071
FF =	1522	1591	1723	1931	2213	2569	3043	3610	4323	5182

SPEED POWER DATA-AIRPLANE
GW = 48225   ALT= 2000   TEMP= 52   OMGR= 540

V =	121.9	141.9	161.9	181.9	201.9	221.9	241.9	261.9	281.9	301.9	321.9
ALPHA =	8.781	5.935	4.058	2.759	1.824	1.129	0.599	0.185	-0.143	-0.409	-0.627
CL =	1.146	0.846	0.650	0.515	0.418	0.346	0.291	0.248	0.214	0.187	0.164
CD =	0.0943	0.0644	0.0501	0.0427	0.0387	0.0364	0.0350	0.0342	0.0337	0.0334	0.0332
F =	84.6	57.4	44.5	37.9	34.3	32.3	31.1	30.3	29.9	29.6	29.4
PROPCL=	0.0892	0.0786	0.0759	0.0779	0.0829	0.0899	0.0982	0.1074	0.1172	0.1275	0.1380
PROPCD=	0.0097	0.0102	0.0107	0.0112	0.0116	0.0119	0.0121	0.0123	0.0125	0.0130	0.0137
PROPN =	78.2	76.4	75.7	75.8	76.4	77.2	78.2	79.1	79.8	80.2	80.2
PWREQD=	2031	2225	2587	3120	3832	4730	5826	7135	8685	10516	12682
UTLHP =	6446										
NORMPW=	7872	7937	8010	8089	8172	8254	8339	8433	8543	8675	8827
L/D =	8.9	9.4	9.3	8.6	7.8	6.9	6.1	5.4	4.8	4.2	3.8
SFC =	0.5964	0.5727	0.5379	0.4992	0.4645	0.4418	0.4229	0.4140	0.4081	0.4068	0.4068
FF =	1211	1274	1392	1558	1780	2090	2464	2954	3544	4278	5159

SPEED POWER DATA-AIRPLANE
GW = 32150   ALT= 2000   TEMP= 52   OMGR= 540

V =	99.5	119.5	139.5	159.5	179.5	199.5	219.5	239.5	259.5	279.5	299.5	319.5
ALPHA =	8.781	5.447	3.418	2.097	1.191	0.542	0.063	-0.302	-0.586	-0.811	-0.993	-1.141
CL =	1.146	0.794	0.583	0.446	0.352	0.285	0.236	0.198	0.169	0.145	0.127	0.111
CD =	0.0943	0.0603	0.0462	0.0398	0.0366	0.0349	0.0340	0.0335	0.0332	0.0330	0.0330	0.0329
F =	84.6	53.7	41.1	35.3	32.4	30.9	30.1	29.7	29.4	29.3	29.2	29.2
PROPCL=	0.0622	0.0547	0.0546	0.0586	0.0652	0.0734	0.0826	0.0925	0.1030	0.1137	0.1247	0.1358
PROPCD=	0.0090	0.0096	0.0102	0.0107	0.0111	0.0115	0.0119	0.0121	0.0123	0.0125	0.0129	0.0136
PROPN =	70.6	69.1	69.4	70.8	72.5	74.2	75.8	77.2	78.5	79.4	80.0	80.1
PWREQD=	1224	1376	1665	2096	2680	3430	4357	5474	6796	8352	10179	12332
UTLHP =	6446											
NORMPW=	7810	7865	7929	8001	8079	8162	8245	8329	8421	8529	8658	8808
L/D =	8.0	8.6	8.3	7.5	6.6	5.7	5.0	4.3	3.8	3.3	2.9	2.6
SFC =	0.7410	0.7016	0.6444	0.5848	0.5287	0.4807	0.4492	0.4273	0.4154	0.4090	0.4063	0.4065
FF =	907	965	1073	1226	1417	1649	1957	2339	2823	3415	4136	5013

SPEED POWER DATA-AIRPLANE
GW = 80375   ALT= 10000   TEMP= 23   OMGR= 600

DESIGN POINT NUMBER 2

V =	177.9	197.9	217.9	237.9	257.9	277.9	297.9	317.9
ALPHA =	8.781	6.700	5.152	3.972	3.053	2.324	1.735	1.254
CL =	1.146	0.926	0.764	0.641	0.545	0.469	0.409	0.359
CD =	0.0943	0.0715	0.0579	0.0496	0.0442	0.0407	0.0384	0.0367
F =	84.6	63.8	51.6	44.1	39.3	36.1	34.0	32.6
PROPCL=	0.1414	0.1267	0.1191	0.1163	0.1169	0.1198	0.1245	0.1305
PROPCD=	0.0110	0.0113	0.0117	0.0120	0.0124	0.0128	0.0132	0.0143
PROPN =	84.6	83.1	82.0	81.2	80.7	80.3	80.2	79.3
PWREQD=	4564	4823	5274	5919	6765	7829	9096	10711
UTLHP =	7162							
NORMPW=	7005	7089	7177	7269	7370	7484	7612	7752
L/D =	9.6	10.1	10.2	9.9	9.4	8.8	8.1	7.3
SFC =	0.4189	0.4137	0.4079	0.4014	0.3944	0.3908	0.3875	0.3862
FF =	1912	1995	2151	2376	2666	3060	3525	4136

SPEED POWER DATA-AIRPLANE
GW = 64300 ALT= 10000 TEMP= 23 OMGR= 600

V =	159.1	179.1	199.1	219.1	239.1	259.1	279.1	299.1	319.1
ALPHA =	8.781	6.493	4.845	3.621	2.688	1.962	1.385	0.920	0.539
CL =	1.146	0.904	0.732	0.604	0.507	0.432	0.372	0.324	0.285
CD =	0.0943	0.0695	0.0556	0.0474	0.0424	0.0392	0.0372	0.0358	0.0349
F =	84.6	62.0	49.5	42.1	37.6	34.8	33.0	31.8	30.9
PROPCL=	0.1175	0.1048	0.0992	0.0981	0.1001	0.1043	0.1100	0.1168	0.1245
PROPCD=	0.0105	0.0109	0.0113	0.0116	0.0120	0.0124	0.0128	0.0132	0.0144
PROPN =	82.3	80.7	79.7	79.1	79.0	79.0	79.0	79.2	78.5
PWREQD=	3357	3580	3974	4540	5284	6216	7357	8701	10392
UTLHP =	7162								
NORMPW=	6930	7010	7095	7182	7275	7377	7491	7620	7761
L/D =	9.3	9.9	9.9	9.5	8.9	8.2	7.5	6.8	6.1
SFC =	0.4521	0.4422	0.4282	0.4155	0.4060	0.3972	0.3913	0.3875	0.3854
FF =	1518	1583	1702	1886	2145	2469	2879	3372	4005

SPEED POWER DATA-AIRPLANE
GW = 48225 ALT= 10000 TEMP= 23 OMGR= 600

V =	137.8	157.8	177.8	197.8	217.8	237.8	257.8	277.8	297.8	317.8
ALPHA =	8.781	6.203	4.429	3.158	2.218	1.505	0.950	0.511	0.157	-0.133
CL =	1.146	0.874	0.688	0.556	0.459	0.385	0.327	0.282	0.245	0.215
CD =	0.0943	0.0668	0.0526	0.0448	0.0403	0.0376	0.0359	0.0348	0.0341	0.0337
F =	84.6	59.6	46.8	39.8	35.7	33.3	31.8	30.9	30.3	29.9
PROPCL=	0.0918	0.0816	0.0781	0.0789	0.0824	0.0879	0.0947	0.1024	0.1107	0.1196
PROPCD=	0.0099	0.0104	0.0109	0.0113	0.0116	0.0119	0.0123	0.0127	0.0131	0.0142
PROPN =	78.5	76.8	76.0	75.9	76.2	76.8	77.4	77.9	78.5	78.0
PWREQD=	2288	2473	2807	3289	3927	4730	5710	6890	8265	9967
UTLHP =	7162									
NORMPW=	6852	6925	7004	7089	7177	7269	7370	7483	7611	7752
L/D =	8.9	9.4	9.4	8.9	8.2	7.4	6.7	6.0	5.3	4.7
SFC =	0.5122	0.4948	0.4724	0.4505	0.4278	0.4115	0.4011	0.3922	0.3881	0.3851
FF =	1172	1224	1326	1482	1680	1946	2291	2702	3208	3838

SPEED POWER DATA-AIRPLANE
GW = 32150 ALT= 10000 TEMP= 23 OMGR= 600

V =	112.5	132.5	152.5	172.5	192.5	212.5	232.5	252.5	272.5	292.5	312.5	332.5
ALPHA =	8.781	5.748	3.808	2.496	1.569	0.890	0.379	-0.016	-0.327	-0.577	-0.780	-0.948
CL =	1.146	0.826	0.624	0.487	0.391	0.321	0.268	0.227	0.195	0.169	0.148	0.131
CD =	0.0943	0.0628	0.0485	0.0415	0.0378	0.0357	0.0345	0.0339	0.0334	0.0332	0.0331	0.0330
F =	84.6	56.0	43.1	36.8	33.5	31.7	30.6	30.0	29.7	29.5	29.3	29.3
PROPCL=	0.0641	0.0567	0.0557	0.0585	0.0637	0.0704	0.0781	0.0866	0.0957	0.1050	0.1147	0.1245
PROPCD=	0.0092	0.0097	0.0103	0.0107	0.0112	0.0115	0.0119	0.0122	0.0126	0.0130	0.0137	0.0159
PROPN =	71.1	69.5	69.5	70.4	71.9	73.4	74.9	76.1	77.0	77.8	78.0	76.5
PWREQD=	1374	1519	1785	2176	2697	3358	4173	5153	6324	7682	9310	11410
UTLHP =	7162											
NORMPW=	6771	6834	6905	6983	7066	7153	7244	7342	7452	7576	7713	7863
L/D =	8.1	8.6	8.4	7.8	7.0	6.2	5.5	4.8	4.3	3.8	3.3	2.9
SFC =	0.6507	0.6184	0.5710	0.5208	0.4770	0.4465	0.4205	0.4057	0.3952	0.3894	0.3855	0.3859
FF =	894	939	1019	1133	1286	1500	1755	2090	2499	2992	3589	4403

SPEED POWER DATA-AIRPLANE
GW = 80375 ALT= 20000 TEMP= -12 OMGR= 600

V =	209.4	229.4	249.4	269.4	289.4	309.4
ALPHA =	8.781	6.974	5.574	4.468	3.581	2.858
CL =	1.146	0.955	0.808	0.692	0.600	0.525
CD =	0.0943	0.0742	0.0613	0.0529	0.0472	0.0432
F =	84.6	66.3	54.6	47.0	41.9	38.4
PROPCL=	0.1837	0.1656	0.1548	0.1492	0.1473	0.1481
PROPCD=	0.0119	0.0123	0.0128	0.0132	0.0142	0.0167
PROPN =	87.0	85.6	84.2	83.2	81.7	78.9
PWREQD=	5224	5473	5894	6468	7275	8425

DESIGN POINT NUMBER   2

UTLHP =	7162					
NORMPW=	5562	5652	5748	5851	5961	6076
L/D =	9.9	10.3	10.4	10.3	9.8	9.1
SFC =	0.3906	0.3887	0.3867	0.3851	0.3844	0.3884
FF =	2041	2127	2279	2491	2797	3272

SPEED POWER DATA-AIRPLANE

	GW =	64300	ALT=	20000	TEMP=	−12	OMGR=	600	
V =	187.3	207.3	227.3	247.3	267.3	287.3	307.3	327.3
ALPHA =	8.781	6.791	5.290	4.132	3.222	2.493	1.901	1.414
CL =	1.146	0.935	0.778	0.657	0.563	0.487	0.426	0.375
CD =	0.0943	0.0723	0.0590	0.0506	0.0451	0.0415	0.0390	0.0373
F =	84.6	64.6	52.6	45.0	40.1	36.8	34.6	33.0
PROPCL=	0.1539	0.1381	0.1295	0.1259	0.1257	0.1280	0.1322	0.1377
PROPCD=	0.0113	0.0116	0.0121	0.0126	0.0130	0.0138	0.0160	0.0198
PROPN =	85.5	84.0	82.7	81.7	81.0	80.1	77.9	74.4
PWREQD=	3807	4011	4367	4876	5527	6377	7544	9120
UTLHP =	7162							
NORMPW=	5470	5552	5642	5738	5840	5949	6064	6185
L/D =	9.7	10.2	10.3	10.0	9.5	8.9	8.0	7.1
SFC =	0.4035	0.3990	0.3938	0.3894	0.3861	0.3830	0.3828	0.3920
FF =	1536	1600	1720	1899	2134	2442	2887	3575

SPEED POWER DATA-AIRPLANE

	GW =	48225	ALT=	20000	TEMP=	−12	OMGR=	600		
V =	162.2	182.2	202.2	222.2	242.2	262.2	282.2	302.2	322.2
ALPHA =	8.781	6.531	4.900	3.683	2.752	2.025	1.446	0.977	0.593
CL =	1.146	0.908	0.737	0.611	0.514	0.439	0.379	0.330	0.290
CD =	0.0943	0.0698	0.0560	0.0478	0.0427	0.0395	0.0374	0.0360	0.0350
F =	84.6	62.3	49.8	42.4	37.9	35.0	33.1	31.9	31.0
PROPCL=	0.1214	0.1084	0.1024	0.1010	0.1028	0.1068	0.1124	0.1191	0.1266
PROPCD=	0.0106	0.0110	0.0114	0.0118	0.0123	0.0127	0.0133	0.0151	0.0182
PROPN =	82.7	81.2	80.1	79.4	78.9	78.8	78.6	77.2	74.5
PWREQD=	2555	2719	3012	3434	3995	4686	5543	6674	8153
UTLHP =	7162								
NORMPW=	5375	5450	5531	5618	5713	5814	5921	6034	6153
L/D =	9.4	9.9	9.9	9.6	9.0	8.3	7.5	6.7	5.8
SFC =	0.4331	0.4246	0.4143	0.4056	0.3963	0.3890	0.3844	0.3811	0.3840
FF =	1107	1155	1248	1393	1583	1823	2131	2543	3131

SPEED POWER DATA-AIRPLANE

	GW =	32150	ALT=	20000	TEMP=	−12	OMGR=	600			
V =	132.5	152.5	172.5	192.5	212.5	232.5	252.5	272.5	292.5	312.5	332.5
ALPHA =	8.781	6.119	4.311	3.030	2.091	1.383	0.835	0.404	0.058	−0.224	−0.457
CL =	1.146	0.865	0.676	0.543	0.445	0.372	0.315	0.271	0.235	0.206	0.182
CD =	0.0943	0.0660	0.0518	0.0441	0.0397	0.0372	0.0356	0.0346	0.0340	0.0336	0.0333
F =	84.6	58.9	46.1	39.2	35.3	33.0	31.6	30.7	30.1	29.8	29.5
PROPCL=	0.0857	0.0761	0.0732	0.0744	0.0783	0.0840	0.0910	0.0989	0.1074	0.1164	0.1257
PROPCD=	0.0098	0.0103	0.0108	0.0112	0.0116	0.0120	0.0125	0.0129	0.0140	0.0162	0.0205
PROPN =	77.2	75.5	74.8	74.9	75.3	75.9	76.5	77.2	76.9	75.3	71.8
PWREQD=	1491	1618	1848	2182	2626	3191	3885	4702	5732	7057	8852
UTLHP =	7162										
NORMPW=	5276	5341	5412	5490	5575	5666	5764	5868	5978	6094	6217
L/D =	8.8	9.3	9.2	8.7	8.0	7.2	6.4	5.7	5.0	4.4	3.7
SFC =	0.5158	0.4978	0.4735	0.4493	0.4252	0.4085	0.3968	0.3879	0.3827	0.3802	0.3880
FF =	769	805	875	980	1117	1304	1541	1824	2194	2683	3435

CLIMB DATA-AIRPLANE, DGW

GW	=64300.0000	ALT=	0.0000	TEMP=	59.0000	OMGR=	600.0000
V =	136.6768	VGND=	135.3022	ALPHA=	8.4456	ALPHAC=	8.1330
PROPNL=	0.7829	CL=	1.1103	CD=	0.0903	DCD=	0.1621
PROPNC=	0.8866	PROPCL=	0.2422	PROPCD=	0.0106	THPR=	6004.6250
THPAP =	7741.2266	THPAQ=	6005.0117	INTMPA=	9232.6270	PWRCL=	7161.9150
RC =	1958.1016	SFC =	0.4219	FF=	3021.4102		

CLIMB DATA-AIRPLANE, DGW

GW	=64300.0000	ALT=	0.0000	TEMP=	59.0000	OMGR=	600.0000
V =	136.6768	VGND=	135.3022	ALPHA=	8.4456	ALPHAC=	8.1330
PROPNL=	0.7829	CL=	1.1103	CD=	0.0903	DCD=	0.1621
PROPNC=	0.8866	PROPCL=	0.2422	PROPCD=	0.0106	THPR=	6004.6250
THPAP =	7741.2266	THRAQ=	6005.0117	INTMPA=	9232.6270	PWRCL=	7161.9150
RC =	1958.1016	SFC =	0.4219	FF=	3021.4102		

CLIMB DATA-AIRPLANE, DGW

GW	=64300.0000	ALT=	5000.0000	TEMP=	41.1710	OMGR=	600.0000
V =	147.2530	VGND=	146.0708	ALPHA=	8.4905	ALPHAC=	7.2652
PROPNL=	0.8042	CL=	1.1150	CD=	0.0908	DCD=	0.1449

```
                             DESIGN POINT NUMBER   2
PROPNC=    0.8922   PROPCL=    0.2574   PROPCD=    0.0111   THPR= 6042.7031
THPAP = 7022.4102   THPAQ= 6042.9531   INTMPA= 8322.7363   PWRCL= 7161.9121
RC    = 1885.7981   SFC   =    0.4107   FF=    2941.1045

CLIMB DATA-AIRPLANE, DGW
GW    =64300.0000       ALT= 5000.0000    TEMP=      41.1710    OMGR=  600.0000
V     =  147.2530    VGND=  146.0708    ALPHA=      8.4905   ALPHAC=    7.2652
PROPNL=    0.8042      CL=    1.1150       CD=      0.0908      DCD=    0.1449
PROPNC=    0.8922   PROPCL=    0.2574   PROPCD=      0.0111     THPR= 6042.7031
THPAP = 7022.4102   THPAQ= 6042.9531   INTMPA=   8322.7363    PWRCL= 7161.9121
RC    = 1885.7981   SFC   =    0.4107   FF=      2941.1045

CLIMB DATA-AIRPLANE, DGW
GW    =64300.0000       ALT=10000.0000    TEMP=      23.3420    OMGR=  600.0000
V     =  159.0768    VGND=  158.0823    ALPHA=      8.5326   ALPHAC=    6.4100
PROPNL=    0.8231      CL=    1.1195       CD=      0.0913      DCD=    0.1279
PROPNC=    0.8968   PROPCL=    0.2730   PROPCD=      0.0116     THPR= 6072.1328
THPAP = 6307.9570   THPAQ= 6074.6133   INTMPA=   7437.0273    PWRCL= 7161.9131
RC    = 1798.4756   SFC   =    0.4006   FF=      2869.0908

CLIMB DATA-AIRPLANE, DGW
GW    =64300.0000       ALT=10000.0000    TEMP=      23.3420    OMGR=  600.0000
V     =  159.0768    VGND=  158.0823    ALPHA=      8.5326   ALPHAC=    6.4100
PROPNL=    0.8231      CL=    1.1195       CD=      0.0913      DCD=    0.1279
PROPNC=    0.8968   PROPCL=    0.2730   PROPCD=      0.0116     THPR= 6072.1328
THPAP = 6307.9570   THPAQ= 6074.6133   INTMPA=   7437.0273    PWRCL= 7161.9131
RC    = 1798.4756   SFC   =    0.4006   FF=      2869.0908

CLIMB DATA-AIRPLANE, DGW
GW    =64300.0000       ALT=15000.0000    TEMP=       5.5130    OMGR=  600.0000
V     =  172.3502    VGND=  171.7718    ALPHA=      8.6108   ALPHAC=    4.6954
PROPNL=    0.8400      CL=    1.1278       CD=      0.0922      DCD=    0.0938
PROPNC=    0.8974   PROPCL=    0.2648   PROPCD=      0.0117     THPR= 5583.8984
THPAP = 5585.6719   THPAQ= 6078.3398   INTMPA=   6581.4209    PWRCL= 6581.4170
RC    = 1428.7346   SFC   =    0.3949   FF=      2598.9600

CLIMB DATA-AIRPLANE, DGW
GW    =64300.0000       ALT=15000.0000    TEMP=       5.5130    OMGR=  600.0000
V     =  172.3502    VGND=  171.7718    ALPHA=      8.6108   ALPHAC=    4.6954
PROPNL=    0.8400      CL=    1.1278       CD=      0.0922      DCD=    0.0938
PROPNC=    0.8974   PROPCL=    0.2648   PROPCD=      0.0117     THPR= 5583.8984
THPAP = 5585.6719   THPAQ= 6078.3398   INTMPA=   6581.4209    PWRCL= 6581.4170
RC    = 1428.7346   SFC   =    0.3949   FF=      2598.9600

CLIMB DATA-AIRPLANE, DGW
GW    =64300.0000       ALT=20000.0000    TEMP=     -12.3160    OMGR=  600.0000
V     =  187.3167    VGND=  187.0867    ALPHA=      8.6858   ALPHAC=    2.8397
PROPNL=    0.8547      CL=    1.1358       CD=      0.0931      DCD=    0.0568
PROPNC=    0.8944   PROPCL=    0.2445   PROPCD=      0.0117     THPR= 4891.2461
THPAP = 4892.6836   THPAQ= 6058.0664   INTMPA=   5784.1865    PWRCL= 5784.1846
RC    =  939.7825   SFC   =    0.3899   FF=      2255.0410

CLIMB DATA-AIRPLANE, DGW
GW    =64300.0000       ALT=20000.0000    TEMP=     -12.3160    OMGR=  600.0000
V     =  187.3167    VGND=  187.0867    ALPHA=      8.6858   ALPHAC=    2.8397
PROPNL=    0.8547      CL=    1.1358       CD=      0.0931      DCD=    0.0568
PROPNC=    0.8944   PROPCL=    0.2445   PROPCD=      0.0117     THPR= 4891.2461
THPAP = 4892.6836   THPAQ= 6058.0664   INTMPA=   5784.1865    PWRCL= 5784.1846
RC    =  939.7825   SFC   =    0.3899   FF=      2255.0410
```

DESIGN POINT NUMBER 2

FUEL FLOWS AND SPEEDS

GW1		
LB.		
80375		
64300		
48225		
32150		

	VHCL	RCH	FFHCL
80375	0	0	0
64300	0	0	0
48225	0	0	0
32150	0	0	0

	1		2		3		4	
	V1	HCR	V1	HCR	V1	HCR	V1	HCR
80375	0	0	0	0	0	0	0	0
64300	0	0	0	0	0	0	0	0
48225	0	0	0	0	0	0	0	0
32150	0	0	0	0	0	0	0	0

	1	1		2			1	2		2	
	V3	ACL	FF1	V3	ACL	FF1	V3	ACL	FF1	V3	ACL	FF1
80375	152	1176	3010	152	1176	3010	164	1087	2932	164	1087	2932
64300	135	1958	3021	135	1958	3021	146	1886	2941	146	1886	2941
48225	114	3177	3033	114	3177	3033	124	3124	2951	124	3124	2951
32150	80	5444	3045	80	5444	3045	89	5417	2963	89	5417	2963

	3			2			1	4		2	
	V3	ACL	FF1	V3	ACL	FF1	V3	ACL	FF1	V3	ACL	FF1
80375	178	987	2859	178	987	2859	193	686	2623	193	686	2623
64300	158	1798	2869	158	1798	2869	172	1429	2599	172	1429	2599
48225	134	3054	2880	134	3054	2880	147	2560	2575	147	2560	2575
32150	99	5372	2893	99	5372	2893	113	4626	2552	113	4626	2552

	1	5		2		
	V3	ACL	FF1	V3	ACL	FF1
80375	209	251	2286	209	251	2286
64300	187	940	2255	187	940	2255
48225	161	1970	2227	161	1970	2227
32150	127	3822	2200	127	3822	2200

	1		2		3		4		5		6	
	V2	ACR	V2	ACR	V2	ACR	V2	ACR	V2	ACR	V2	ACR
80375	0	0	238	2372	0	0	209	1933	253	2587	0	0
64300	0	0	224	1931	0	0	247	1889	264	2563	0	0
48225	0	0	203	1524	0	0	222	1385	273	2591	0	0
32150	0	0	192	1277	0	0	197	1009	277	2614	0	0

7		8		9	
V2	ACR	V2	ACR	V2	ACR
209	2041	165	1872	157	1869
257	2008	147	1486	141	1522
272	1956	128	1174	122	1211
282	1996	104	873	100	907

DESIGN POINT NUMBER   2

SEGMENT	MODE	WP	H	V	D	T	W	FR
(21 SEGMENTS)	(START)	18660	0	0	0	0.000	64300	0
1	WUP	18660	0	0	0	0.017	64265	35
2	TOF	18660	0	0	0	0.033	64214	86
3	ALO	18660	0	141	0	0.050	64189	111
4	ACL	18660	20000	180	33	0.256	63626	674
5	ACR	18660	20000	248	170	0.807	62596	1704
6	ACR	18660	20000	248	171	0.811	62589	1711
7	DSC	18660	10000	248	187	0.878	62551	1749
8	ACR	18660	10000	222	188	0.882	62543	1757
9	DSC	18660	2000	222	200	0.936	62513	1787
10	ALO	18660	2000	139	200	0.961	62476	1824
11	DSC	18660	1000	139	200	0.977	62464	1836
12	DSC	18660	0	139	200	0.998	62446	1854
13	GND	18660	0	0	200	1.015	62412	1888
14	ACR	18660	20000	248	227	1.038	62167	2133
15	DSC	18660	5000	248	248	1.122	62121	2179
16	ALO	18660	5000	145	248	1.455	61643	2657
17	DSC	18660	2000	145	250	1.471	61636	2664
18	ALO	18660	2000	138	250	1.496	61599	2701
19	DSC	18660	1000	138	250	1.513	61588	2712
20	DSC	18660	0	138	250	1.534	61570	2730
21	WUP	18660	0	0	250	1.551	61535	2765

MISSION FUEL, INCLUDING RESERVES, IS: 2765
FUEL RESERVES AT MAX. ENDURANCE CONDITION

END OF MISSION
DESIGN GROSS WEIGHT =   64300   , FUEL REQUIRED =   2765   , FUEL AVAILABLE =   2766
ENTER 1 FOR WT. EST. PARAMETERS, OR 2 TO REPEAT ACER01 & MSJD04:
2.7059E+00   9.4175E+01   2.5376E+03   3.2740E+00   2.9204E+01   4.3399E+00   2.6991E+02   2.1014E+02
3.1354E+01   4.0334E+01   4.4888E+02   5.2373E+01   3.8326E+01   1.0662E-01   2.0610E+02   2.4764E+02
2.7648E+03   8.8690E+02   1.0000E+01   1.0149E+00   1.0149E+00   2.0003E+02   1.1845E-01   4.9782E+00
3.6548E+00   1.9052E+01   5.1560E+01   5.3061E+01   1.0000E+00   4.0000E+00   4.2976E+03   4.2720E+04
8.3700E+02   4.3961E+03   5.7229E+00   1.3508E+04   4.4262E+00   1.7781E+04   3.8046E+03   2.5728E+02
4.0848E+00   2.0000E+04   1.8884E+03   7.2749E+00   4.9299E-01   7.8740E-01   1.4436E+00   0.0000E+00
0.0000E+00   1.8660E+04   2.0000E+00
SOLUTION IN RANGE. ENTER 0 TO QUIT; 1 TO PRINT; ANYTHING ELSE FOR COST AND PRINT:

DESIGN POINT NUMBER   2

COST CHARACTERISTICS
1974 DOLLARS

BASIC AIRCRAFT DATA
```
DESIGN GROSS WEIGHT, LBS                              64300
WEIGHT EMPTY, LBS                                     42720
ROTOR DIAMETER, FT                                    43.63
RATED POWER PER ENGINE (IRP SLS), SHP                  2268
DISC LOADING, PSF                                     16.15
WING LOADING, PSF                                     72.50
POWER LOADING, LB/HP                                   7.09
```

COST FACTORS
```
DEPRECIATION PERIOD, YRS                                 12
UTILIZATION, BHR/YR                                    2500
ENGINE TBO, BHR                                        4500
DYNAMIC SYSTEMS TBO, BHR                               3000
MAINTENANCE LABOR RATE, $/MHR                          6.00
MAINTENANCE BURDEN, (RATIO OF DIRECT LABOR)            1.50
INSURANCE RATE, % AIRCRAFT INITIAL COST                2.00
FLIGHT CREW COST (TOTAL), $/BHR                      138.31
FUEL COST RATE, $/LB                                  0.020
PRODUCTION QUANTITY                                     300
```

AIRCRAFT COMPONENT COSTS
```
AIRFRAME, $(M) @ $90 PER LB                           2.601
DYNAMIC SYSTEMS,$(M)                                  0.932
ENGINES, $(M)                                         0.482
AVIONICS, $(M)                                        0.250
RDTE/UNIT, $(M)                                       0.000
SPARES, $(M)                                          0.634
TOTAL INITIAL (EA.), $(M)                             4.899
```

DIRECT OPERATING COST BREAKDOWN
```
DEPRECIATION, $/BHR                                  163.31
MAINTENANCE PARTS, $/BHR                              65.15
MAINTENANCE LABOR, $/BHR                             163.75
INSURANCE, $/BHR                                      34.12
CREW, $/BHR                                          138.31
FUEL, $/BHR                                           40.31
OTHER, $/BHR                                           0.00
```

SUMMARY
```
DIRECT OPERATING COST, $/BLOCK-HR                    604.96
DIRECT OPERATING COST, $/TON-NMI                       0.34
DIRECT OPERATING COST, CENTS/ASSM                      2.67
```

COST CHARACTERISTICS
1974 DOLLARS

BASIC AIRCRAFT DATA

DESIGN GROSS WEIGHT, LBS	64300
WEIGHT EMPTY, LBS	42720
ROTOR DIAMETER, FT	43.63
RATED POWER PER ENGINE (IRP SLS), SHP	2268
DISC LOADING, PSF	16.15
WING LOADING, PSF	72.50
POWER LOADING, LB/HP	7.09

COST FACTORS

DEPRECIATION PERIOD, YRS	12
UTILIZATION, BHR/YR	3500
ENGINE TBO, BHR	4500
DYNAMIC SYSTEMS TBO, BHR	3000
MAINTENANCE LABOR RATE, $/MHR	6.00
MAINTENANCE BURDEN, (RATIO OF DIRECT LABOR)	1.50
INSURANCE RATE, % AIRCRAFT INITIAL COST	2.00
FLIGHT CREW COST (TOTAL), $/BHR	138.31
FUEL COST RATE, $/LB	0.020
PRODUCTION QUANTITY	300

AIRCRAFT COMPONENT COSTS

AIRFRAME, $(M) @ $90 PER LB	2.601
DYNAMIC SYSTEMS, $(M)	0.932
ENGINES, $(M)	0.482
AVIONICS, $(M)	0.250
RDTE/UNIT, $(M)	0.000
SPARES, $(M)	0.634
TOTAL INITIAL (EA.), $(M)	4.899

DIRECT OPERATING COST BREAKDOWN

DEPRECIATION, $/BHR	116.65
MAINTENANCE PARTS, $/BHR	65.15
MAINTENANCE LABOR, $/BHR	163.75
INSURANCE, $/BHR	24.37
CREW, $/BHR	138.31
FUEL, $/BHR	40.31
OTHER, $/BHR	0.00

SUMMARY

DIRECT OPERATING COST, $/BLOCK-HR	548.55
DIRECT OPERATING COST, $/TON-NMI	0.31
DIRECT OPERATING COST, CENTS/ASSM	2.42

DESIGN POINT NUMBER 2

COST CHARACTERISTICS
1974 DOLLARS

BASIC AIRCRAFT DATA
```
   DESIGN GROSS WEIGHT, LBS                              64300
   WEIGHT EMPTY, LBS                                     42720
   ROTOR DIAMETER, FT                                    43.63
   RATED POWER PER ENGINE (IRP SLS), SHP                 2268
   DISC LOADING, PSF                                     16.15
   WING LOADING, PSF                                     72.50
   POWER LOADING, LB/HP                                  7.09
```

COST FACTORS
```
   DEPRECIATION PERIOD, YRS                                 12
   UTILIZATION, BHR/YR                                    2500
   ENGINE TBO, BHR                                        4500
   DYNAMIC SYSTEMS TBO, BHR                               3000
   MAINTENANCE LABOR RATE, $/MHR                          6.00
   MAINTENANCE BURDEN, (RATIO OF DIRECT LABOR)            1.50
   INSURANCE RATE, % AIRCRAFT INITIAL COST               2.00
   FLIGHT CREW COST (TOTAL), $/BHR                      138.31
   FUEL COST RATE, $/LB                                  0.020
   PRODUCTION QUANTITY                                     300
```

AIRCRAFT COMPONENT COSTS
```
   AIRFRAME, $(M) @ $110 PER LB                          3.179
   DYNAMIC SYSTEMS,$(M)                                  0.932
   ENGINES, $(M)                                         0.482
   AVIONICS, $(M)                                        0.250
   ROTE/UNIT, $(M)                                       0.000
   SPARES, $(M)                                          0.680
   TOTAL INITIAL (EA.), $(M)                             5.524
```

DIRECT OPERATING COST BREAKDOWN
```
   DEPRECIATION, $/BHR                                  184.12
   MAINTENANCE PARTS, $/BHR                              70.49
   MAINTENANCE LABOR, $/BHR                             163.75
   INSURANCE, $/BHR                                      38.75
   CREW, $/BHR                                          138.31
   FUEL, $/BHR                                           40.31
   OTHER, $/BHR                                           0.00
```

SUMMARY
```
   DIRECT OPERATING COST, $/BLOCK-HR                    635.72
   DIRECT OPERATING COST, $/TON-NMI                       0.36
   DIRECT OPERATING COST, CENTS/ASSM                      2.80
```

COST CHARACTERISTICS
1974 DOLLARS

BASIC AIRCRAFT DATA
```
DESIGN GROSS WEIGHT, LBS                                64300
WEIGHT EMPTY, LBS                                       42720
ROTOR DIAMETER, FT                                      43.63
RATED POWER PER ENGINE (IRP SLS), SHP                    2268
DISC LOADING, PSF                                       16.15
WING LOADING, PSF                                       72.50
POWER LOADING, LB/HP                                     7.09
```

COST FACTORS
```
DEPRECIATION PERIOD, YRS                                   12
UTILIZATION, BHR/YR                                      3500
ENGINE TBO, BHR                                          4500
DYNAMIC SYSTEMS TBO, BHR                                 3000
MAINTENANCE LABOR RATE, $/MHR                            6.00
MAINTENANCE BURDEN, (RATIO OF DIRECT LABOR)              1.50
INSURANCE RATE, % AIRCRAFT INITIAL COST                  2.00
FLIGHT CREW COST (TOTAL), $/BHR                        138.31
FUEL COST RATE, $/LB                                    0.020
PRODUCTION QUANTITY                                       300
```

AIRCRAFT COMPONENT COSTS
```
AIRFRAME, $(M) @ $110 PER LB                            3.179
DYNAMIC SYSTEMS,$(M)                                    0.932
ENGINES, $(M)                                           0.482
AVIONICS, $(M)                                          0.250
RDTE/UNIT, $(M)                                         0.000
SPARES, $(M)                                            0.680
TOTAL INITIAL (EA.), $(M)                               5.524
```

DIRECT OPERATING COST BREAKDOWN
```
DEPRECIATION, $/BHR                                    131.51
MAINTENANCE PARTS, $/BHR                                70.49
MAINTENANCE LABOR, $/BHR                               163.75
INSURANCE, $/BHR                                        27.68
CREW, $/BHR                                            138.31
FUEL, $/BHR                                             40.31
OTHER, $/BHR                                             0.00
```

SUMMARY
```
DIRECT OPERATING COST, $/BLOCK-HR                      572.04
DIRECT OPERATING COST, $/TON-NMI                         0.32
DIRECT OPERATING COST, CENTS/ASSM                        2.52
```

GROUP WEIGHT STATEMENT

ROTOR GROUP		4298 LBS
WING GROUP		5149
TAIL GROUP		691
HORIZONTAL	396	
VERTICAL	295	
BODY GROUP		7871
LANDING GEAR		2730
NOSE	646	
MAIN	2045	
AUXILIARY	39	
FLIGHT CONTROLS GROUP		3530
NONROTATING	2597	
ROTATING	481	
CONVERSION SYSTEM	452	
ENGINE SECTION		633
PROPULSION GROUP		7835
ENGINE INSTALLATION	1712	
EXHAUST SYSTEM	96	
LUBRICATION SYSTEM	336	
FUEL SYSTEM	190	
ENGINE CONTROLS	244	
STARTING SYSTEM	134	
DRIVE SYSTEM	5123	
GEARBOXES	4396	
SHAFTING	727	
INSTRUMENT GROUP		293
HYDRAULIC GROUP		416
ELECTRICAL GROUP		495
AVIONICS GROUP		458
FURNISHINGS AND EQUIPMENT GROUP		5917
ENVIRONMENTAL CONTROL GROUP		2066
AUXILIARY POWER UNIT		338
OTHER		0
LOAD HANDLING GROUP		0
WEIGHT EMPTY		42720 LBS

TO SEE ALL NASAWT VARIABLES ENTER 1; ELSE 0:

MISSION WEIGHT SUMMARY

WEIGHT EMPTY	42720	LBS
CREW	660	
PAYLOAD	18000	
AUXILIARY TANK	0	
TRAPPED FLUIDS	154	
FUEL AVAILABLE	2766	
MISSION GROSS WEIGHT	64300	
DESIGN GROSS WEIGHT	64300	LBS

DESIGN POINT NUMBER   2

WING STRUCTURAL DATA

BASIC DIMENSIONS
```
  SPAN BETWEEN ROTOR CENTERS, IN                         747.576
  BOX MAXIMUM THICKNESS, %MAC                             23.000
  FRONT SPAR LOCATION, %MAC                              10.000
  AFT SPAR LOCATION, %MAC                                 55.000
  SPOILER  LENGTH, IN                                   802.000
  FLAP LENGTH, IN                                        802.000
```

TORSIONAL CHARACTERISTICS
```
  DESIGN PYLON PITCH INERTIA, SLUG-FT2                  9951.629
  DESIGN SHEAR MODULUS, PSI                          4500000.000
  AREA OF BOX CROSS SECTION, FT2                          7.813
  PERIMETER OF BOX SECTION, FT                           11.443
  POLAR INERTIA OF BOX, IN4                             7848.328
  WING TORSIONAL SPRING RATE, FT-LB/RAD              7322610.000
```

BENDING CHARACTERISTICS
```
  DESIGN VERTICAL THRUST AT EACH TIP, LBS             34787.938
  RESULTING JUMP TAKEOFF MOMENT, IN-LBS             8895048.000
  DESIGN NORMAL FORCE IN AIRPLANE, LBS                80375.000
  RESULTING ROOT MOMENT IN AIPLANE, IN-LBS          9334829.000
  DESIGN ROOT BENDING STRESS, PSI                     50000.000
  BENDING INERTIA OF BOX, IN4                          2668.973
```

DETAIL DIMENSIONS
```
  SPAR AND BOX PANEL SKIN THICKNESS, IN                   0.213
    (INNER + OUTER SKINS)
  TOTAL BOX PANEL THICKNESS, IN                           1.345
    (INCLUDES CORE THICKNESS)
  DENSITY OF BOX SKINS, LBS/CU IN                         0.078
  FUEL CAPACITY PER 100 INCHES CELL SPAN, LBS          2485.866
```

WING WEIGHT BREAKDOWN
```
  PRIMARY STRUCTURE, LBS                               3024.325
  SECONDARY STRUCTURE, LBS                              312.783
  FLAPERONS, LBS                                         0.000
  FLAPS AND SPOILERS, LBS                              1341.474
  WING FOLD FEATURE, LBS                                 0.000
  OUTER PANEL PRIMARY STRUCTURE, LBS                    269.785
  OUTER PANEL SECONDARY STRUCTURE, LBS                  200.395
```

```
  WING DESIGN GOVERNED BY:                            ABENDING
ENTER 1 FOR AIRCRAFT DATA REPORT, 0 TO SKIP:
1
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                        AIRCRAFT DATA

AIRCRAFT CHARACTERISTICS-
  AVAILABLE PASSENGER SEATS   100.000
  MAXIMUM GROSS WEIGHT, LB   64300.000
  DESIGN GROSS WEIGHT, LB   64300.000
  WEIGHT EMPTY, LB   42720.000
  LIMIT FLIGHT LOAD FACTOR, G   2.500
  OVERALL DIMENSIONS (ROTORS TURNING)-
    HELICOPTER MODE:
      LENGTH, FT   98.750
      WIDTH, FT   106.590
      HEIGHT, FT   32.830
      DISTANCE BETWEEN ROTOR CENTERS, FT   62.962
    AIRPLANE MODE:
      LENGTH, FT   98.750
      WIDTH, FT   105.926
      HEIGHT, FT   32.830
      DISTANCE BETWEEN ROTOR CENTERS, FT   62.298
  NEUTRAL CENTER OF GRAVITY LOCATION-
    STOL MODE: MAST 60 DEGREES
      STATION LINE, IN   496.071.
      BUTTOCK LINE, IN   0.000
      WATER LINE, IN   215.700
    AIRPLANE MODE:
      STATION LINE, IN   495.006
      BUTTOCK LINE, IN   0.000
      WATER LINE, IN   210.49·
  MOMENT OF INERTIA-
    HELICOPTER MODE:
      PITCH, SLG-FT2   384536.313
      ROLL, SLG-FT2   767058.813
      YAW, SLG-FT2   1123608.000
      CROSS(R-Y), SLG-FT2   9368.344
    AIRPLANE MODE:
      PITCH, SLG-FT2   357189.000
      ROLL, SLG-FT2   733682.375
      YAW, SLG-FT2   1142531.000
      CROSS(R-Y), SLG-FT2   5667.844
  GROUND LOCATION-
    WATER LINE, IN   37.484

ROTOR CHARACTERISTICS-
  HUB TYPE   GIMBAL
  BLADE TYPE   STIFF-INPLANE
  DIRECTION OF ROTATION (INBOARD TIP MOTION):
    HELICOPTER/AIRPLANE   AFT/UP
  NUMBER OF BLADES   3.000
  DISC LOADING AT DST, LB/FT2   16.150
  BLADE LOADING COEFF. (CT/SIGMA) AT DST SL 90F   0.124
  ROTOR SPEED-
    HELICOPTER MODE:
      TIP SPEED, FT/SEC   700.000
      RPM   306.432
    AIRPLANE MODE:
      TIP SPEED, FT/SEC   600.000
      RPM   262.656
  SOLIDITY   0.118
  DISC AREA PER ROTOR, FT2   1494.932
  ROTOR DIAMETER, FT   43.628
  BLADE CHORD, IN   32.471
  BLADE TWIST(EFFECTIVE), DEG   44.100
  DELTA THREE, DEG   -15.000
  BLADE FLAPPING INERTIA, SLG-FT2   1498.343
  FLAPPING SPRING RATE, FT-LB/DEG   1209.617
  LONG. AND LAT. FLAPPING RESTRAINT, FT-LB/DEG   1814.425
  PRECONE ANGLE, DEG   2.500
  BLADE INPLANE EFFECTIVE MASS, LBS   228.294
  BLADE INPLANE MOMENT OF INERTIA, SLG-FT2   476.540
  DIST FROM VIRTUAL HINGE TO BLADE CG, FT   6.980
  DIST FROM VIRTUAL HINGE TO MAST CENTER, FT   6.946
  RAD. OF GYRATION ABOUT BLADE CG, FT   4.363

DRIVE SYSTEM-
  ENGINE TO TILT ROTOR GEAR RATIO   58.024

DESIGN POINT NUMBER 2

ENGINE TO INTERCONNECT GEAR RATIO	1.976
INTERCONNECT TO ROTOR GEAR RATIO	29.370
RATED TORQUE OF ROTOR SHAFT, FT-LB	115994.188
RATED TORQUE OF INTERCONNECT SHAFT, FT-LB	2537.616
RATED TORQUE OF ENGINE DRIVE SHAFT, FT-LB	836.997
DRIVE SYSTEM INERTIA AT ROTOR SHAFT, SLG-FT2	10720.883

POWER PLANT-

NUMBER OF ENGINES	4.000
INTERMEDIATE RATED POWER(TOTAL-SLS), HP	9071.094
POWER LOADING AT DGW, LB/HP	7.088
EMERGENCY POWER RATING(PER ENGINE-SL, 90F), HP	2329.457
ENGINE TORQUE AT EMERGENCY RATING, FT-LB	687.811
MAX. CONT. POWER RATING(PER ENGINE-SLS), HP	2070.478

POD CHARACTERISTICS-
CONVERSION PIVOT LOCATION:

STATION LINE, IN	472.800
BUTTOCK LINE, IN	373.788
WATER LINE, IN	250.000
DISTANCE BETWEEN PIVOT AND HUB CENTER, IN	91.367
POD LENGTH AHEAD OF PIVOT, IN	159.426
POD LENGTH AFT OF PIVOT, IN	130.000
POD WIDTH, IN	60.000
POD HEIGHT, IN	68.675
POD WEIGHT (EACH), LBS	6753.984
DISTANCE FROM PIVOT TO POD CG, IN	25.290

WING-

WING LOADING AT DGW, LB/FT2	72.500
WING AREA, FT2	886.896
FLAP AREA(TOTAL), FT2	245.467
SPOILER AREA(TOTAL), FT2	94.410
WING SPAN, FT	94.175

WING MEAN AERODYNAMIC CHORD:

CHORD, FT	9.418
STATION LINE(1/4 MAC), IN	495.006
BUTTOCK LINE(1/4 MAC), IN	265.471
WATER LINE(1/4 MAC), IN	240.134
LEADING EDGE STATION, IN	466.753
TRAILING EDGE STATION, IN	579.763
ASPECT RATIO	10.000
TAPER RATIO	1.370
SWEEP, DEG	0.000
DIHEDRAL, DEG	2.000
INCIDENCE, DEG	4.000
AIRFOIL THICKNESS, % MAC	23.000
MAXIMUM THICKNESS LOCATION, % MAC	40.000
FRONT SPAR STATION AT FUSELAGE, IN	478.035
AFT SPAR STATION AT FUSELAGE, IN	540.213

TAIL-
HORIZONTAL:

VOLUME COEFFICIENT	1.639
ASPECT RATIO	3.745
HORIZONTAL TAIL ARM, FT	50.708
AREA, FT2	269.913
SPAN, FT	31.833
MEAN AERODYNAMIC CHORD, FT	8.500
1/4 MAC STATION LINE, IN	1103.500
1/4 MAC BUTTOCK LINE, IN	95.500
1/4 MAC WATER LINE, IN	287.500
SWEEP(MAX THICKNESS), DEG	0.000
ELEVATOR AREA, FT2	81.174

VERTICAL:

NUMBER OF FINS	2.000
VOLUME COEFFICIENT	0.130
ASPECT RATIO(EACH)	2.440
VERTICAL TAIL ARM, FT	52.030
AREA(TOTAL), FT2	210.136
SPAN(EACH), FT	16.000
MEAN AERODYNAMIC CHORD, FT	6.563
1/4 MAC STATION LINE, IN	1119.360
1/4 MAC BUTTOCK LINE, IN	191.000
1/4 MAC WATER LINE, IN	329.830
SWEEP(UPPER PANEL, MAX THICKNESS), DEG	13.768
RUDDER AREA, FT2	61.400

BELL HELICOPTER COMPANY   PAGE   14
DESIGN SYNTHESIS PROGRAM   DATE 06/12/75
                            DESIGN POINT NUMBER   2
FUSELAGE-
   MOST FORWARD STATION LINE, IN   30.000
   MOST AFT STATION LINE, IN   1180.000
   TOP STRINGER WATER LINE, IN   237.524
   BOTTOM STRINGER WATER LINE, IN   67.484
   MAX WIDTH BUTTOCK LINE, IN   100.020
   LENGTH, FT   95.833
   WIDTH, FT   16.670
   HEIGHT, FT   14.170

LANDING GEAR-
   ULTIMATE LANDING LOAD FACTOR,   G   5.250
   LANDING SPEED, KNOTS   80.000
   NOSE(TURN CENTER GROUND LEVEL):
      STATION LINE, IN   80.000
   MAIN(EFFECTIVE CENTER GROUND LEVEL):
      STATION LINE, IN   568.533
      BUTTOCK LINE, IN   121.717
   TAIL BUMPER
      STATION LINE, IN   1140.000
      WATER LINE, IN   177.500

        ANALYSIS COMPLETED FOR PT NO   2

ENTER OPTION TO READ NEW ARRAYS:
1

ENTER 0 TO SKIP DESIGN DATA AND GO DIRECTLY TO TECHNOLOGY DATA:
FUNDAM IS NEXT. ENTER 1 TO READ, 0 TO SKIP:

100 PAX
2 ENG

D313-099-002

DESIGN POINT NUMBER 19
DGW = 64850

COMPONENT ZERO-LIFT DRAG. AIRPLANE. FLAPS UP

WING	HOR	VERT	FUS	NAC	BOOMS	EXT	MISC	TOTAL
5.88	1.84	1.44	10.52	3.89	0.00	2.00	0.00	25.57

DRAG WITH LIFT. AIRPLANE. FLAPS UP

ALPHA	CL	CD	CLWP	CLH	CLPRP	CDWP	CDF	CDH
-4.00000	-0.17517	0.04111	-0.07022	-0.10208	-0.00287	0.01298	0.01916	0.00446
-2.00000	0.02935	0.03635	0.10532	-0.07470	-0.00127	0.01321	0.01513	0.00351
0.00000	0.23354	0.03683	0.28086	-0.04732	0.00000	0.01568	0.01379	0.00285
2.00000	0.43794	0.04253	0.45640	-0.01995	0.00149	0.02041	0.01513	0.00249
4.00000	0.64311	0.05347	0.63194	0.00743	0.00374	0.02738	0.01916	0.00242
6.00000	0.84961	0.06963	0.80748	0.03481	0.00732	0.03660	0.02588	0.00265
8.00000	1.05800	0.09102	0.98302	0.06219	0.01279	0.04808	0.03527	0.00317
10.00000	1.26886	0.11764	1.15856	0.08957	0.02074	0.06180	0.04736	0.00399
12.00000	1.48281	0.14949	1.33409	0.11694	0.03178	0.07777	0.06213	0.00510
14.00000	1.70047	0.18657	1.50963	0.14432	0.04652	0.09599	0.07958	0.00650

SPEED POWER DATA-AIRPLANE

GW	=	64850	ALT=	0	TEMP=	59	OMGR=	600				
V	=	148.0	168.0	188.0	208.0	228.0	248.0	268.0	288.0	308.0	328.0	348.0
ALPHA	=	8.836	6.382	4.650	3.387	2.438	1.708	1.135	0.676	0.304	-0.003	-0.258
CL	=	1.146	0.889	0.710	0.580	0.483	0.408	0.349	0.303	0.265	0.233	0.207

DESIGN POINT NUMBER 19

CD =	0.1015	0.0733	0.0582	0.0496	0.0445	0.0414	0.0394	0.0382	0.0374	0.0368	0.0365
F =	78.4	56.3	44.5	37.9	34.0	31.6	30.1	29.1	28.5	28.1	27.8
PROPCL=	0.0963	0.0856	0.0814	0.0814	0.0842	0.0867	0.0947	0.1016	0.1093	0.1174	0.1259
PROPCD=	0.0101	0.0106	0.0111	0.0114	0.0118	0.0120	0.0123	0.0126	0.0130	0.0136	0.0152
PROPN =	79.4	77.7	76.6	76.2	76.4	76.8	77.4	77.8	78.1	78.3	77.1
PWREQD=	3514	3776	4243	4914	5794	6891	8222	9822	11714	13914	16721
UTLHP =	7162										
NORMPW=	11242	11346	11457	11573	11686	11804	11938	12099	12296	12522	12772
L/D =	8.4	8.9	8.8	8.4	7.8	7.2	6.5	5.8	5.2	4.7	4.1
SFC =	0.5677	0.5481	0.5194	0.4874	0.4604	0.4387	0.4193	0.4065	0.3976	0.3907	0.3864
FF =	1995	2070	2204	2395	2667	3023	3448	3993	4657	5437	6461

VMC=Q LIMITED
VMCX = 248.0
FF = 3023.4

SPEED POWER DATA-AIRPLANE

GW = 81063	ALT=	5000	TEMP=	41	OMGR=	540					
V =	178.3	198.3	218.3	238.3	258.3	278.3	298.3	318.3	338.3	358.3	
ALPHA =	8.836	6.739	5.176	3.983	3.064	2.316	1.720	1.233	0.829	0.491	
CL =	1.146	0.926	0.764	0.641	0.546	0.470	0.409	0.359	0.318	0.284	
CD =	0.1015	0.0769	0.0623	0.0534	0.0476	0.0439	0.0414	0.0397	0.0386	0.0377	
F =	78.4	59.1	47.8	40.8	36.4	33.5	31.6	30.3	29.4	28.8	
PROPCL=	0.1559	0.1388	0.1298	0.1262	0.1264	0.1292	0.1340	0.1401	0.1473	0.1553	
PROPCD=	0.0112	0.0116	0.0119	0.0122	0.0123	0.0126	0.0129	0.0137	0.0145	0.0157	
PROPN =	85.8	84.2	82.9	62.0	81.6	81.4	81.1	80.5	79.8	78.9	
PWREQD=	4897	5180	5673	6370	7275	8406	9798	11497	13504	15883	
UTLHP =	6446										
NORMPW=	10060	10166	10278	10391	10514	10656	10823	11012	11221	11448	
L/D =	9.1	9.5	9.6	9.3	8.8	8.2	7.6	6.9	6.2	5.6	
SFC =	0.4573	0.4499	0.4394	0.4273	0.4174	0.4110	0.4053	0.4017	0.4001	0.3992	
FF =	2239	2330	2492	2722	3036	3455	3971	4618	5402	6341	

SPEED POWER DATA-AIRPLANE

GW = 64850	ALT=	5000	TEMP=	41	OMGR=	540					
V =	159.4	179.4	199.4	219.4	239.4	259.4	279.4	299.4	319.4	339.4	359.4
ALPHA =	8.836	6.530	4.866	3.629	2.685	1.949	1.366	0.894	0.508	0.189	−0.079
CL =	1.146	0.905	0.732	0.605	0.508	0.433	0.373	0.325	0.285	0.253	0.225
CD =	0.1015	0.0748	0.0598	0.0510	0.0457	0.0423	0.0402	0.0387	0.0378	0.0371	0.0367
F =	78.4	57.4	45.8	39.0	34.9	32.3	30.8	29.6	28.8	28.3	28.0
PROPCL=	0.1302	0.1154	0.1086	0.1069	0.1087	0.1129	0.1188	0.1259	0.1339	0.1425	0.1516
PROPCD=	0.0107	0.0111	0.0116	0.0119	0.0121	0.0123	0.0125	0.0129	0.0137	0.0145	0.0157
PROPN =	83.9	82.1	80.6	80.1	79.8	79.9	80.1	80.1	79.7	79.3	78.5
PWREQD=	3585	3826	4257	4876	5681	6684	7906	9380	11157	13234	15697
UTLHP =	6446										
NORMPW=	9964	10066	10175	10284	10397	10522	10665	10833	11024	11233	11462
L/D =	8.9	9.3	9.3	9.0	8.4	7.7	7.0	6.4	5.7	5.1	4.6
SFC =	0.5056	0.4917	0.4722	0.4534	0.4371	0.4220	0.4121	0.4063	0.4014	0.3997	0.3986
FF =	1813	1881	2010	2211	2484	2821	3258	3811	4479	5289	6257

SPEED POWER DATA-AIRPLANE

GW = 48638	ALT=	5000	TEMP=	41	OMGR=	540					
V =	138.1	158.1	178.1	198.1	218.1	238.1	258.1	278.1	298.1	318.1	338.1	358.1
ALPHA =	8.836	6.237	4.445	3.160	2.209	1.487	0.925	0.480	0.121	−0.172	−0.415	−0.619
CL =	1.146	0.874	0.689	0.557	0.459	0.385	0.328	0.283	0.248	0.216	0.191	0.170
CD =	0.1015	0.0719	0.0566	0.0482	0.0434	0.0406	0.0388	0.0377	0.0370	0.0366	0.0363	0.0361
F =	78.4	55.2	43.3	36.9	33.2	31.0	29.6	28.8	28.2	27.9	27.7	27.6
PROPCL=	0.1024	0.0904	0.0860	0.0865	0.0900	0.0957	0.1027	0.1108	0.1196	0.1289	0.1386	0.1485
PROPCD=	0.0102	0.0106	0.0111	0.0115	0.0119	0.0121	0.0123	0.0125	0.0129	0.0136	0.0144	0.0156
PROPN =	80.6	78.7	77.6	77.2	77.3	77.8	78.5	79.1	79.4	79.3	79.0	78.3
PWREQD=	2424	2622	2985	3513	4212	5084	6143	7411	8923	10728	12827	15297
UTLHP =	6446										
NORMPW=	9863	9957	10059	10167	10277	10389	10513	10654	10821	11010	11219	11446
L/D =	8.5	9.0	8.9	8.4	7.7	7.0	6.3	5.6	5.0	4.4	3.9	3.5
SFC =	0.5923	0.5716	0.5404	0.5051	0.4715	0.4473	0.4285	0.4147	0.4076	0.4017	0.3997	0.3983
FF =	1436	1499	1613	1775	1986	2274	2632	3073	3637	4310	5127	6092

SPEED POWER DATA-AIRPLANE

GW = 32425	ALT=	5000	TEMP=	41	OMGR=	540					
V =	112.7	132.7	152.7	172.7	192.7	212.7	232.7	252.7	272.7	292.7	312.7	332.7
ALPHA =	8.836	5.778	3.817	2.490	1.552	0.864	0.346	−0.054	−0.370	−0.623	−0.829	−0.999
CL =	1.146	0.827	0.624	0.488	0.392	0.322	0.269	0.228	0.196	0.170	0.149	0.132
CD =	0.1015	0.0676	0.0523	0.0447	0.0408	0.0387	0.0374	0.0367	0.0363	0.0361	0.0360	0.0359
F =	78.4	51.8	40.0	34.2	31.1	29.5	28.6	28.0	27.7	27.6	27.5	27.4
PROPCL=	0.0720	0.0633	0.0618	0.0646	0.0700	0.0771	0.0854	0.0944	0.1040	0.1139	0.1240	0.1344
PROPCD=	0.0094	0.0100	0.0105	0.0110	0.0114	0.0118	0.0120	0.0122	0.0124	0.0127	0.0134	0.0142
PROPN =	74.2	72.3	71.9	72.5	73.5	74.7	76.0	77.2	78.2	78.9	79.1	78.9
PWREQD=	1434	1587	1875	2300	2871	3599	4487	5551	6811	8299	10063	12130

DESIGN POINT NUMBER 19

UTLHP	=	6446										
NORMPW	=	9758	9840	9931	10031	10138	10247	10359	10478	10614	10774	10958	11161
L/D	=	7.8	8.3	8.1	7.5	6.7	5.9	5.2	4.5	4.0	3.5	3.1	2.7
SFC	=	0.7448	0.7083	0.6562	0.6006	0.5465	0.4988	0.4611	0.4379	0.4196	0.4098	0.4031	0.3999
FF	=	1068	1124	1230	1381	1569	1795	2069	2431	2858	3401	4056	4851

SPEED POWER DATA-AIRPLANE

GW	=	81063	ALT=	2000	TEMP=	52	OMGR=	540			
V	=	170.4	190.4	210.4	230.4	250.4	270.4	290.4	310.4	330.4	350.4
ALPHA	=	8.836	6.656	5.053	3.841	2.905	2.167	1.576	1.095	0.698	0.367
CL	=	1.146	0.918	0.752	0.627	0.531	0.455	0.395	0.345	0.305	0.271
CD	=	0.1015	0.0761	0.0613	0.0524	0.0468	0.0432	0.0409	0.0393	0.0382	0.0375
F	=	78.4	58.4	47.0	40.1	35.8	33.0	31.2	30.0	29.2	28.6
PROPCL=		0.1450	0.1289	0.1206	0.1180	0.1189	0.1223	0.1275	0.1341	0.1416	0.1499
PROPCD=		0.0110	0.0114	0.0116	0.0120	0.0123	0.0124	0.0127	0.0132	0.0141	0.0149
PROPN	=	85.1	83.4	82.1	81.3	80.9	80.8	80.8	80.5	79.9	79.4
PWREQD=		4720	5009	5520	6247	7192	8369	9806	11547	13643	16053
UTLHP	=	6446									
NORMPW=		10648	10755	10866	10975	11092	11224	11381	11568	11779	12010
L/D	=	9.0	9.5	9.5	9.2	8.7	8.0	7.4	6.7	6.0	5.4
SFC	=	0.4775	0.4672	0.4544	0.4408	0.4269	0.4164	0.4104	0.4048	0.4023	0.4010
FF	=	2254	2340	2508	2754	3071	3485	4025	4674	5489	6437

SPEED POWER DATA-AIRPLANE

GW	=	64850	ALT=	2000	TEMP=	52	OMGR=	540			
V	=	152.4	172.4	192.4	212.4	232.4	252.4	272.4	292.4	312.4	332.4	352.4
ALPHA	=	8.836	6.441	4.736	3.483	2.536	1.803	1.225	0.761	0.384	0.072	-0.188
CL	=	1.146	0.895	0.719	0.590	0.493	0.418	0.359	0.311	0.273	0.241	0.214
CD	=	0.1015	0.0739	0.0588	0.0501	0.0449	0.0417	0.0397	0.0384	0.0375	0.0369	0.0366
F	=	78.4	56.7	45.0	38.3	34.3	31.9	30.3	29.3	28.6	28.2	27.9
PROPCL=		0.1209	0.1070	0.1010	0.1000	0.1024	0.1071	0.1134	0.1208	0.1291	0.1380	0.1473
PROPCD=		0.0105	0.0110	0.0114	0.0118	0.0120	0.0122	0.0124	0.0127	0.0133	0.0141	0.0150
PROPN	=	83.0	81.2	79.9	79.2	79.1	79.3	79.6	79.9	79.8	79.4	79.0
PWREQD=		3465	3712	4158	4803	5645	6695	7970	9501	11333	13515	16010
UTLHP	=	6446									
NORMPW=		10558	10659	10767	10877	10987	11104	11238	11398	11588	11801	12035
L/D	=	8.8	9.2	9.2	8.8	8.2	7.5	6.8	6.1	5.5	4.9	4.4
SFC	=	0.5364	0.5204	0.4969	0.4707	0.4498	0.4328	0.4185	0.4108	0.4048	0.4019	0.4006
FF	=	1859	1932	2066	2261	2539	2897	3335	3903	4587	5432	6413

SPEED POWER DATA-AIRPLANE

GW	=	48638	ALT=	2000	TEMP=	52	OMGR=	540			
V	=	132.0	152.0	172.0	192.0	212.0	232.0	252.0	272.0	292.0	312.0	332.0	352.0
ALPHA	=	8.836	6.140	4.308	3.012	2.061	1.345	0.792	0.356	0.006	-0.278	-0.513	-0.709
CL	=	1.146	0.864	0.675	0.542	0.444	0.371	0.314	0.270	0.234	0.205	0.181	0.161
CD	=	0.1015	0.0710	0.0556	0.0474	0.0428	0.0401	0.0385	0.0375	0.0368	0.0365	0.0362	0.0361
F	=	78.4	54.5	42.6	36.2	32.7	30.6	29.3	28.6	28.1	27.8	27.6	27.5
PROPCL=		0.0948	0.0836	0.0799	0.0810	0.0850	0.0910	0.0984	0.1067	0.1157	0.1252	0.1350	0.1450
PROPCD=		0.0100	0.0105	0.0109	0.0116	0.0117	0.0120	0.0122	0.0124	0.0127	0.0132	0.0141	0.0149
PROPN	=	79.4	77.5	76.5	76.3	76.5	77.2	77.9	78.7	79.2	79.4	79.1	78.8
PWREQD=		2353	2557	2933	3483	4214	5130	6243	7573	9152	11026	13248	15775
UTLHP	=	6446									
NORMPW=		10464	10556	10657	10764	10875	10984	11101	11235	11395	11584	11796	12030
L/D	=	8.4	8.9	8.8	8.2	7.5	6.8	6.0	5.4	4.8	4.2	3.7	3.3
SFC	=	0.6287	0.6054	0.5702	0.5309	0.4920	0.4596	0.4386	0.4214	0.4117	0.4053	0.4019	0.4004
FF	=	1479	1548	1672	1849	2073	2358	2738	3192	3768	4470	5324	6317

SPEED POWER DATA-AIRPLANE

GW	=	32425	ALT=	2000	TEMP=	52	OMGR=	540			
V	=	107.8	127.8	147.8	167.8	187.8	207.8	227.8	247.8	267.8	287.8	307.8	327.8
ALPHA	=	8.836	5.668	3.673	2.341	1.409	0.732	0.225	-0.164	-0.469	-0.713	-0.911	-1.074
CL	=	1.146	0.815	0.609	0.473	0.377	0.308	0.257	0.217	0.186	0.161	0.141	0.124
CD	=	0.1015	0.0666	0.0513	0.0440	0.0403	0.0383	0.0372	0.0366	0.0362	0.0361	0.0360	0.0359
F	=	78.4	51.1	39.2	33.6	30.8	29.2	28.4	27.9	27.7	27.5	27.4	27.4
PROPCL=		0.0665	0.0584	0.0575	0.0607	0.0664	0.0738	0.0822	0.0914	0.1010	0.1111	0.1213	0.1317
PROPCD=		0.0093	0.0098	0.0104	0.0109	0.0113	0.0117	0.0120	0.0122	0.0123	0.0126	0.0131	0.0139
PROPN	=	72.4	70.6	70.5	71.4	72.7	74.1	75.5	76.8	77.9	78.7	79.1	79.0
PWREQD=		1403	1562	1861	2305	2904	3667	4605	5729	7060	8628	10476	12656
UTLHP	=	6446									
NORMPW=		10368	10446	10536	10635	10741	10852	10961	11076	11205	11358	11542	11750
L/D	=	7.6	8.1	7.9	7.2	6.4	5.6	4.9	4.3	3.8	3.3	2.9	2.6
SFC	=	0.7913	0.7502	0.6909	0.6286	0.5705	0.5183	0.4749	0.4467	0.4268	0.4135	0.4071	0.4032
FF	=	1110	1172	1286	1449	1656	1901	2187	2559	3013	3568	4265	5040

SPEED POWER DATA-AIRPLANE

GW	=	81063	ALT=	10000	TEMP=	23	OMGR=	600			
V	=	192.6	212.6	232.6	252.6	272.6	292.6	312.6	332.6	352.6		

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ALPHA =	8.836	8.874	8.382	4.223	3.308	2.571	1.971	1.475	1.060
CL =	1.146	0.940	0.786	0.606	0.572	0.496	0.435	0.384	0.342
CD =	0.1015	0.0783	0.0641	0.0550	0.0491	0.0451	0.0424	0.0408	0.0392
F =	78.4	60.2	49.1	42.1	37.5	34.5	32.4	30.9	29.9
PROPCL=	0.1490	0.1338	0.1253	0.1215	0.1210	0.1230	0.1267	0.1317	0.1377
PROPCD=	0.0113	0.0116	0.0120	0.0123	0.0128	0.0131	0.0138	0.0161	0.0199
PROPN =	85.1	83.6	82.4	81.5	80.7	80.2	79.5	77.2	73.7
PWREQD=	5334	5609	6082	6754	7642	8726	10093	11955	14438
UTLHP =	7162								
NORMPW=	9356	9471	9591	9722	9867	10031	10213	10411	10624
L/D =	9.0	9.4	9.5	9.3	8.9	8.3	7.7	6.9	6.1
SFC =	0.4275	0.4210	0.4137	0.4062	0.3993	0.3918	0.3870	0.3824	0.3806
FF =	2280	2361	2516	2743	3051	3418	3906	4572	5494

SPEED POWER DATA-AIRPLANE
GW = 64850   ALT= 10000   TEMP= 23   OMGR= 600

V =	172.2	192.2	212.2	232.2	252.2	272.2	292.2	312.2	332.2	352.2
ALPHA =	8.836	6.676	5.082	3.875	2.940	2.202	1.610	1.127	0.729	0.396
CL =	1.146	0.920	0.755	0.630	0.534	0.459	0.398	0.349	0.308	0.274
CD =	0.1015	0.0763	0.0616	0.0526	0.0470	0.0434	0.0410	0.0394	0.0383	0.0375
F =	78.4	58.6	47.2	40.2	35.9	33.1	31.3	30.1	29.2	28.6
PROPCL=	0.1243	0.1111	0.1046	0.1025	0.1035	0.1067	0.1115	0.1175	0.1243	0.1317
PROPCD=	0.0108	0.0112	0.0115	0.0119	0.0122	0.0127	0.0130	0.0138	0.0159	0.0195
PROPN =	83.1	81.4	80.3	79.5	79.1	78.6	78.8	78.4	76.5	73.2
PWREQD=	3912	4147	4557	5145	5914	6885	8045	9477	11372	13878
UTLHP =	7162									
NORMPW=	9244	9354	9469	9589	9719	9864	10028	10210	10407	10620
L/D =	8.8	9.2	9.3	9.0	8.5	7.9	7.2	6.6	5.8	5.1
SFC =	0.4658	0.4565	0.4436	0.4276	0.4140	0.4034	0.3948	0.3879	0.3828	0.3795
FF =	1822	1893	2022	2200	2448	2778	3177	3676	4353	5266

SPEED POWER DATA-AIRPLANE
GW = 48638   ALT= 10000   TEMP= 23   OMGR= 600

V =	149.2	169.2	189.2	209.2	229.2	249.2	269.2	289.2	309.2	329.2	349.2	369.2
ALPHA =	8.836	6.398	4.674	3.413	2.464	1.734	1.159	0.699	0.325	0.017	-0.239	-0.455
CL =	1.146	0.891	0.712	0.583	0.485	0.411	0.352	0.305	0.267	0.235	0.209	0.187
CD =	0.1015	0.0735	0.0583	0.0497	0.0446	0.0415	0.0395	0.0382	0.0374	0.0369	0.0365	0.0363
F =	78.4	56.4	44.6	38.0	34.1	31.7	30.1	29.2	28.5	28.1	27.8	27.7
PROPCL=	0.0976	0.0868	0.0825	0.0823	0.0850	0.0896	0.0955	0.1024	0.1100	0.1181	0.1266	0.1353
PROPCD=	0.0102	0.0107	0.0111	0.0115	0.0118	0.0121	0.0125	0.0129	0.0135	0.0154	0.0186	0.0259
PROPN =	79.6	77.8	76.8	76.4	76.5	76.8	77.1	77.5	77.6	76.2	73.5	67.5
PWREQD=	2652	2847	3193	3692	4349	5174	6184	7382	8813	10680	13090	16739
UTLHP =	7162											
NORMPW=	9126	9227	9337	9451	9570	9699	9841	10002	10181	10376	10586	10812
L/D =	8.4	8.9	8.8	8.5	7.9	7.2	6.5	5.8	5.2	4.6	4.0	3.3
SFC =	0.5423	0.5238	0.4972	0.4702	0.4475	0.4256	0.4096	0.3990	0.3896	0.3840	0.3799	0.3835
FF =	1439	1491	1588	1736	1946	2202	2533	2945	3433	4102	4967	6419

SPEED POWER DATA-AIRPLANE
GW = 32425   ALT= 10000   TEMP= 23   OMGR= 600

V =	121.8	141.8	161.8	181.8	201.8	221.8	241.8	261.8	281.8	301.8	321.8	341.8
ALPHA =	8.836	5.959	4.060	2.746	1.799	1.096	0.560	0.142	-0.191	-0.459	-0.680	-0.862
CL =	1.146	0.845	0.649	0.514	0.417	0.346	0.291	0.248	0.214	0.187	0.164	0.145
CD =	0.1015	0.0693	0.0539	0.0460	0.0417	0.0393	0.0379	0.0371	0.0366	0.0363	0.0361	0.0360
F =	78.4	53.1	41.2	35.1	31.9	30.0	28.9	28.3	27.9	27.7	27.5	27.5
PROPCL=	0.0685	0.0606	0.0589	0.0609	0.0652	0.0712	0.0782	0.0860	0.0944	0.1031	0.1121	0.1213
PROPCD=	0.0094	0.0100	0.0105	0.0109	0.0113	0.0117	0.0120	0.0124	0.0128	0.0132	0.0145	0.0170
PROPN =	72.9	71.1	70.6	71.1	72.2	73.4	74.6	75.6	76.4	77.1	76.5	74.5
PWREQD=	1577	1729	2005	2407	2941	3617	4446	5444	6628	8004	9729	11942
UTLHP =	7162											
NORMPW=	9002	9091	9189	9296	9409	9526	9650	9786	9940	10113	10302	10507
L/D =	7.7	8.2	8.0	7.5	6.8	6.1	5.4	4.8	4.2	3.8	3.3	2.8
SFC =	0.6983	0.6643	0.6163	0.5631	0.5129	0.4717	0.4436	0.4197	0.4045	0.3940	0.3862	0.3809
FF =	1101	1148	1236	1355	1509	1706	1973	2285	2681	3153	3758	4548

SPEED POWER DATA-AIRPLANE
GW = 81063   ALT= 20000   TEMP= -12   OMGR= 600

V =	226.8	246.8	266.8	286.8	306.8	326.8	346.8
ALPHA =	8.836	7.125	5.791	4.713	3.836	3.111	2.508
CL =	1.146	0.968	0.825	0.717	0.626	0.552	0.490
CD =	0.1015	0.0811	0.0677	0.0586	0.0524	0.0480	0.0448
F =	78.4	62.4	51.9	44.9	40.0	36.6	34.2
PROPCL=	0.1925	0.1740	0.1624	0.1557	0.1527	0.1524	0.1541
PROPCD=	0.0124	0.0129	0.0132	0.0141	0.0165	0.0204	0.0283
PROPN =	87.1	85.6	84.3	82.6	79.7	75.7	68.9
PWREQD=	6137	6411	6842	7493	8483	9886	12112
UTLHP =	7162						

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NORMPW=	7466	7593	7728	7872	8024	8184	8352
L/D =	9.2	9.6	9.7	9.5	9.0	8.2	7.1
SFC =	0.3920	0.3896	0.3872	0.3836	0.3802	0.3789	0.3883
FF =	2406	2497	2649	2875	3228	3746	4703

SPEED POWER DATA-AIRPLANE

GW = 64850 ALT= 20000 TEMP= -12 OMGR= 600

V =	202.8	222.8	242.8	262.8	282.8	302.8	322.8	342.8
ALPHA =	8.836	6.960	5.515	4.382	3.476	2.743	2.140	1.640
CL =	1.146	0.949	0.799	0.682	0.589	0.514	0.452	0.401
CD =	0.1015	0.0792	0.0652	0.0561	0.0501	0.0460	0.0431	0.0411
F =	78.4	60.9	50.0	43.0	38.3	35.1	32.9	31.4
PROPCL=	0.1618	0.1456	0.1362	0.1315	0.1303	0.1315	0.1347	0.1392
PROPCD=	0.0116	0.0120	0.0126	0.0129	0.0135	0.0154	0.0186	0.0253
PROPN =	85.9	84.3	82.8	81.8	80.7	78.5	75.2	69.3
PWREQD=	4457	4678	5058	5579	6280	7274	8623	10677
UTLHP =	7162							
NORMPW=	7326	7442	7568	7701	7843	7993	8152	8318
L/D =	9.1	9.5	9.6	9.4	9.0	8.3	7.5	6.4
SFC =	0.4083	0.4042	0.3986	0.3920	0.3866	0.3818	0.3775	0.3791
FF =	1820	1891	2016	2187	2427	2777	3255	4048

SPEED POWER DATA-AIRPLANE

GW = 48638 ALT= 20000 TEMP= -12 OMGR= 600

V =	175.7	195.7	215.7	235.7	255.7	275.7	295.7	315.7	335.7	355.7
ALPHA =	8.836	6.712	5.136	3.937	3.005	2.267	1.673	1.187	0.786	0.450
CL =	1.146	0.924	0.760	0.637	0.541	0.465	0.404	0.355	0.314	0.279
CD =	0.1015	0.0766	0.0620	0.0530	0.0474	0.0437	0.0412	0.0396	0.0384	0.0377
F =	78.4	58.9	47.5	40.6	36.2	33.4	31.5	30.2	29.3	28.7
PROPCL=	0.1284	0.1148	0.1079	0.1056	0.1064	0.1094	0.1140	0.1198	0.1265	0.1338
PROPCD=	0.0109	0.0113	0.0117	0.0122	0.0126	0.0130	0.0143	0.0168	0.0216	0.0317
PROPN =	83.4	81.8	80.6	79.6	79.0	78.7	77.4	75.1	70.8	63.0
PWREQD=	2979	3153	3460	3903	4481	5198	6148	7400	9168	11996
UTLHP =	7162									
NORMPW=	7182	7286	7400	7522	7652	7791	7939	8094	8258	8429
L/D =	8.8	9.3	9.3	9.0	8.5	7.9	7.2	6.4	5.5	4.4
SFC =	0.4471	0.4379	0.4255	0.4134	0.4034	0.3938	0.3855	0.3796	0.3755	0.3853
FF =	1332	1381	1472	1614	1808	2047	2370	2809	3443	4622

SPEED POWER DATA-AIRPLANE

GW = 32425 ALT= 20000 TEMP= -12 OMGR= 600

V =	143.4	163.4	183.4	203.4	223.4	243.4	263.4	283.4	303.4	323.4	343.4	363.4
ALPHA =	8.836	6.317	4.558	3.284	2.334	1.607	1.039	0.586	0.220	-0.060	-0.330	-0.540
CL =	1.146	0.883	0.701	0.570	0.472	0.398	0.340	0.293	0.256	0.225	0.200	0.178
CD =	0.1015	0.0727	0.0575	0.0490	0.0440	0.0410	0.0391	0.0380	0.0372	0.0367	0.0364	0.0362
F =	78.4	55.8	44.0	37.4	33.6	31.3	29.9	29.0	28.4	28.0	27.8	27.6
PROPCL=	0.0912	0.0810	0.0773	0.0776	0.0806	0.0855	0.0917	0.0988	0.1066	0.1148	0.1234	0.1323
PROPCD=	0.0101	0.0106	0.0110	0.0114	0.0118	0.0123	0.0127	0.0133	0.0150	0.0179	0.0244	0.0370
PROPN =	78.4	76.6	75.7	75.4	75.5	75.7	76.2	76.5	75.3	72.9	67.5	58.9
PWREQD=	1725	1859	2097	2443	2903	3488	4189	5044	6158	7601	9751	13175
UTLHP =	7162											
NORMPW=	7031	7122	7221	7329	7446	7571	7705	7847	7998	8157	8323	8498
L/D =	8.3	8.7	8.7	8.3	7.7	6.9	6.3	5.6	4.9	4.2	3.5	2.7
SFC =	0.5472	0.5272	0.4991	0.4704	0.4456	0.4224	0.4062	0.3945	0.3845	0.3780	0.3750	0.3963
FF =	944	980	1047	1149	1294	1473	1702	1990	2367	2873	3657	5221

CLIMB DATA-AIRPLANE, DGW

GW	=64850.0000	ALT=	0.0000	TEMP=	59.0000	OMGR=	600.0000
V	= 147.9910	VGND=	147.0038	ALPHA=	8.5743	ALPHAC=	6.6216
PROPNL=	0.7945	CL=	1.1183	CD=	0.0981	DCD=	0.1321
PROPNC=	0.8837	PROPCL=	0.2182	PROPCD=	0.0106	THPR=	5985.2070
THPAP	=10263.9961	THPAO=	5985.7227	INTMPA=12281.3750	PWRCL=	7162.2080
RC	= 1728.1533	SFC =	0.4446	FF=	3184.3228

CLIMB DATA-AIRPLANE, DGW
GW =64850.0000 ALT= 5000.0000 TEMP= 41.1710 OMGR= 600.0000
V = 159.4426 VGND= 158.6192 ALPHA= 8.6127 ALPHAC= 5.8256
PROPNL= 0.8136 CL= 1.1223 CD= 0.0986 DCD= 0.1163
PROPNC= 0.8887 PROPCL= 0.2312 PROPCD= 0.0111 THPR= 6019.4766

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```
THPAP = 9319.0156    THPAQ= 6019.8086   INTMPA=11087.5234    PWRCL= 7162.2090
RC    = 1638.8655    SFC   =    0.4240   FF=      3036.6948
```

CLIMB DATA-AIRPLANE, DGW
```
GW    =64850.0000      ALT= 5000.0000    TEMP=     41.1710    OMGR=    600.0000
V     =  159.4426     VGND=  158.6192    ALPHA=     8.6127    ALPHAC=    5.8256
PROPNL=    0.8136       CL=    1.1223    CD=        0.0986    DCD=       0.1163
PROPNC=    0.8887    PROPCL=    0.2312   PROPCD=     0.0111   THPR= 6019.4766
THPAP = 9319.0156    THPAQ= 6019.8086   INTMPA=11087.5234    PWRCL= 7162.2090
RC    = 1638.8655    SFC   =    0.4240   FF=      3036.6948
```

CLIMB DATA-AIRPLANE, DGW
```
GW    =64850.0000      ALT=10000.0000    TEMP=     23.3420    OMGR=    600.0000
V     =  172.2453     VGND=  171.5783    ALPHA=     8.6485    ALPHAC=    5.0440
PROPNL=    0.8307       CL=    1.1261    CD=        0.0991    DCD=       0.1007
PROPNC=    0.8931    PROPCL=    0.2445   PROPCD=     0.0115   THPR= 6046.5273
THPAP = 8381.2148    THPAQ= 6049.4375   INTMPA= 9922.9063    PWRCL= 7162.2070
RC    = 1533.5933    SFC   =    0.4107   FF=      2941.7510
```

CLIMB DATA-AIRPLANE, DGW
```
GW    =64850.0000      ALT=10000.0000    TEMP=     23.3420    OMGR=    600.0000
V     =  172.2453     VGND=  171.5783    ALPHA=     8.6485    ALPHAC=    5.0440
PROPNL=    0.8307       CL=    1.1261    CD=        0.0991    DCD=       0.1007
PROPNC=    0.8931    PROPCL=    0.2445   PROPCD=     0.0115   THPR= 6046.5273
THPAP = 8381.2148    THPAQ= 6049.4375   INTMPA= 9922.9063    PWRCL= 7162.2070
RC    = 1533.5933    SFC   =    0.4107   FF=      2941.7510
```

CLIMB DATA-AIRPLANE, DGW
```
GW    =64850.0000      ALT=15000.0000    TEMP=      5.5130    OMGR=    600.0000
V     =  186.6175     VGND=  186.0934    ALPHA=     8.6812    ALPHAC=    4.2949
PROPNL=    0.8458       CL=    1.1295    CD=        0.0995    DCD=       0.0858
PROPNC=    0.8973    PROPCL=    0.2585   PROPCD=     0.0119   THPR= 6075.8555
THPAP = 7464.0469    THPAQ= 6077.9609   INTMPA= 8795.5625    PWRCL= 7162.2095
RC    = 1415.2854    SFC   =    0.3986   FF=      2854.8447
```

CLIMB DATA-AIRPLANE, DGW
```
GW    =64850.0000      ALT=15000.0000    TEMP=      5.5130    OMGR=    600.0000
V     =  186.6175     VGND=  186.0934    ALPHA=     8.6812    ALPHAC=    4.2949
PROPNL=    0.8458       CL=    1.1295    CD=        0.0995    DCD=       0.0858
PROPNC=    0.8973    PROPCL=    0.2585   PROPCD=     0.0119   THPR= 6075.8555
THPAP = 7464.0469    THPAQ= 6077.9609   INTMPA= 8795.5625    PWRCL= 7162.2095
RC    = 1415.2854    SFC   =    0.3986   FF=      2854.8447
```

CLIMB DATA-AIRPLANE, DGW
```
GW    =64850.0000      ALT=20000.0000    TEMP=    -12.3160    OMGR=    600.0000
V     =  202.8229     VGND=  202.4316    ALPHA=     8.7117    ALPHAC=    3.5598
PROPNL=    0.8586       CL=    1.1327    CD=        0.0999    DCD=       0.0711
PROPNC=    0.9001    PROPCL=    0.2726   PROPCD=     0.0124   THPR= 6095.3789
THPAP = 6596.0742    THPAQ= 6096.8242   INTMPA= 7748.7012    PWRCL= 7162.2065
RC    = 1275.2856    SFC   =    0.3902   FF=      2794.7754
```

CLIMB DATA-AIRPLANE, DGW
```
GW    =64850.0000      ALT=20000.0000    TEMP=    -12.3160    OMGR=    600.0000
V     =  202.8229     VGND=  202.4316    ALPHA=     8.7117    ALPHAC=    3.5598
PROPNL=    0.8586       CL=    1.1327    CD=        0.0999    DCD=       0.0711
PROPNC=    0.9001    PROPCL=    0.2726   PROPCD=     0.0124   THPR= 6095.3789
THPAP = 6596.0742    THPAQ= 6096.8242   INTMPA= 7748.7012    PWRCL= 7162.2065
RC    = 1275.2856    SFC   =    0.3902   FF=      2794.7754
```

DESIGN POINT NUMBER 19

FUEL FLOWS AND SPEEDS

GW1

LB.
81063
64850
48638
32425

	VHCL	RCH	FFHCL
81063	0	0	0
64850	0	0	0
48638	0	0	0
32425	0	0	0

	1		2		3		4	
	V1	HCR	V1	HCR	V1	HCR	V1	HCR
81063	0	0	0	0	0	0	0	0
64850	0	0	0	0	0	0	0	0
48638	0	0	0	0	0	0	0	0
32425	0	0	0	0	0	0	0	0

	1		1	2			1	2		2	
	V3	ACL	FF1	V3	ACL	FF1	V3	ACL	FF1	V3	ACL	FF1
81063	165	920	3170	165	920	3170	178	814	3022	178	814	3022
64850	147	1728	3184	147	1728	3184	159	1639	3037	159	1639	3037
48638	125	2979	3199	125	2979	3199	135	2912	3054	135	2912	3054
32425	91	5308	3214	91	5308	3214	100	5269	3071	100	5269	3071

	3	1			2			1	4		2	
	V3	ACL	FF1	V3	ACL	FF1	V3	ACL	FF1	V3	ACL	FF1
81063	192	693	2929	192	693	2929	209	554	2843	209	554	2843
64850	172	1534	2942	172	1534	2942	186	1415	2855	186	1415	2855
48638	147	2828	2956	147	2828	2956	159	2727	2868	159	2727	2868
32425	110	5212	2972	110	5212	2972	122	5133	2883	122	5133	2883

	5	1			2	
	V3	ACL	FF1	V3	ACL	FF1
81063	227	387	2786	227	387	2786
64850	202	1275	2795	202	1275	2795
48638	174	2610	2807	174	2610	2807
32425	135	5037	2824	135	5037	2824

	1		2		3		4		5		6	
	V2	ACR	V2	ACR	V2	ACR	V2	ACR	V2	ACR	V2	ACR
81063	0	0	258	2810	0	0	272	2724	258	2813	0	0
64850	0	0	242	2315	0	0	273	2283	277	2870	0	0
48638	0	0	224	1878	0	0	241	1655	284	2834	0	0
32425	0	0	212	1592	0	0	218	1245	287	2790	0	0

	7		8		9	
	V2	ACR	V2	ACR	V2	ACR
	272	2697	178	2239	170	2254
	298	2679	159	1812	152	1859
	311	2685	136	1436	132	1479
	313	2598	113	1068	108	1111

DESIGN POINT NUMBER 19

SEGMENT	MODE	WP	H	V	D	T	W	FR
(21 SEGMENTS)	(START)	18660	0	0	0	0.000	64850	0
1	WUP	18660	0	0	0	0.017	64804	46
2	TOF	18660	0	0	0	0.033	64736	114
3	ALO	18660	0	152	0	0.050	64705	145
4	ACL	18660	20000	195	37	0.266	64069	781
5	ACR	18660	20000	300	167	0.700	62907	1943
6	ACR	18660	20000	271	168	0.704	62899	1951
7	DSC	18660	10000	271	186	0.770	62854	1996
8	ACR	18660	10000	240	187	0.774	62845	2005
9	DSC	18660	2000	240	200	0.828	62809	2041
10	ALO	18660	2000	150	200	0.853	62764	2086
11	DSC	18660	1000	150	200	0.869	62747	2103
12	DSC	18660	0	150	200	0.890	62722	2128
13	GND	18660	0	0	200	0.907	62676	2174
14	ACR	18660	20000	270	225	0.913	62436	2414
15	DSC	18660	5000	270	247	0.996	62381	2469
16	ALO	18660	5000	156	247	1.329	61799	3051
17	DSC	18660	2000	156	250	1.346	61791	3059
18	ALO	18660	2000	149	250	1.371	61746	3104
19	DSC	18660	1000	149	250	1.388	61729	3121
20	DSC	18660	0	149	250	1.409	61705	3145
21	WUP	18660	0	0	250	1.425	61659	3191

MISSION FUEL, INCLUDING RESERVES, IS: 3191
FUEL RESERVES AT MAX. ENDURANCE CONDITION

END OF MISSION
DESIGN GROSS WEIGHT =   64850   , FUEL REQUIRED =   3191   , FUEL AVAILABLE =   3197
ENTER 1 FOR WT. EST. PARAMETERS, OR 2 TO REPEAT ACEB01 & MSJD04:

2.7059E+00	8.7346E+01	6.7195E+03	3.2583E+00	2.9204E+01	4.3191E+00	2.1224E+02	1.6580E+0.
3.2177E+01	5.8539E+01	4.1634E+02	5.3749E+01	3.9333E+01	9.1723E-02	2.0830E+02	3.0035E+0
3.1910E+03	7.6294E+02	1.0000E+01	9.0695E-01	9.0695E-01	2.0009E+02	1.1845E-01	4.9776E+0
3.6814E+00	1.9066E+01	5.2320E+01	5.3658E+01	1.0000E+00	4.0000E+00	4.2976E+03	4.2835E+0
2.3488E+03	4.6623E+03	6.3475E+00	1.4089E+04	4.8030E+00	1.6778E+04	3.7847E+03	2.6636E+0
4.0848E+00	2.0000E+04	2.1737E+03	7.2749E+00	1.3054E+00	1.1281E+00	2.0681E+00	0.0000E+0
0.0000E+00	1.8660E+04	2.0000E+00					

TRY DGW= 64844
ENTER 1, TO TRY ANOTHER DGW; 0 TO QUIT:
ENTER 1 FOR PRINTOUT ANYWAY, 2 TO INCLUDE COST, ANYTHING ELSE TO QUIT:

COST CHARACTERISTICS
1974 DOLLARS

BASIC AIRCRAFT DATA
    DESIGN GROSS WEIGHT, LBS   64850
    WEIGHT EMPTY, LBS   42835
    ROTOR DIAMETER, FT   43.63
    RATED POWER PER ENGINE (IRP SLS), SHP   6005
    DISC LOADING, PSF   16.15
    WING LOADING, PSF   85.00
    POWER LOADING, LB/HP   5.40

COST FACTORS
    DEPRECIATION PERIOD, YRS   12
    UTILIZATION, BHR/YR   2500
    ENGINE TBO, BHR   4500
    DYNAMIC SYSTEMS TBO, BHR   3000
    MAINTENANCE LABOR RATE, $/MHR   6.00
    MAINTENANCE BURDEN, (RATIO OF DIRECT LABOR)   1.50
    INSURANCE RATE, % AIRCRAFT INITIAL COST   2.00
    FLIGHT CREW COST (TOTAL), $/BHR   138.34
    FUEL COST RATE, $/LB   0.100
    PRODUCTION QUANTITY   300

AIRCRAFT COMPONENT COSTS
    AIRFRAME, $(M)   2.555
    DYNAMIC SYSTEMS,$(M)   0.968
    ENGINES, $(M)   0.518
    AVIONICS, $(M)   0.250
    RDTE/UNIT, $(M)   0.000
    SPARES, $(M)   0.654
    TOTAL INITIAL (EA.), $(M)   4.944

DIRECT OPERATING COST BREAKDOWN
    DEPRECIATION, $/BHR   164.81
    MAINTENANCE PARTS, $/BHR   69.52
    MAINTENANCE LABOR, $/BHR   154.84
    INSURANCE, $/BHR   34.32
    CREW, $/BHR   138.34
    FUEL, $/BHR   259.63
    OTHER, $/BHR   0.00

SUMMARY
    DIRECT OPERATING COST, $/BLOCK-HR   821.46
    DIRECT OPERATING COST, $/TON-NMI   0.41
    DIRECT OPERATING COST, CENTS/ASSM   3.24

DESIGN POINT NUMBER 19

GROUP WEIGHT STATEMENT

ROTOR GROUP		4298 LBS
WING GROUP		4885
TAIL GROUP		588
HORIZONTAL	326	
VERTICAL	262	
BODY GROUP		7879
LANDING GEAR		2749
NOSE	649	
MAIN	2061	
AUXILIARY	39	
FLIGHT CONTROLS GROUP		3439
NONROTATING	2506	
ROTATING	481	
CONVERSION SYSTEM	452	
ENGINE SECTION		358
PROPULSION GROUP		8700
ENGINE INSTALLATION	1893	
EXHAUST SYSTEM	99	
LUBRICATION SYSTEM	611	
FUEL SYSTEM	199	
ENGINE CONTROLS	122	
STARTING SYSTEM	159	
DRIVE SYSTEM	5617	
GEARBOXES	4662	
SHAFTING	955	
INSTRUMENT GROUP		293
HYDRAULIC GROUP		416
ELECTRICAL GROUP		495
AVIONICS GROUP		468
FURNISHINGS AND EQUIPMENT GROUP		5873
ENVIRONMENTAL CONTROL GROUP		2066
AUXILIARY POWER UNIT		338
OTHER		0
LOAD HANDLING GROUP		0
WEIGHT EMPTY		42835 LBS

TO SEE ALL NASAWT VARIABLES ENTER 1; ELSE 0:

MISSION WEIGHT SUMMARY

WEIGHT EMPTY	42835 LBS
CREW	660
PAYLOAD	18000
AUXILIARY TANK	0
TRAPPED FLUIDS	158
FUEL AVAILABLE	3197
MISSION GROSS WEIGHT	64850
DESIGN GROSS WEIGHT	64850 LBS

DESIGN POINT NUMBER 19

WING STRUCTURAL DATA

BASIC DIMENSIONS
SPAN BETWEEN ROTOR CENTERS, IN ... 747.576
BOX MAXIMUM THICKNESS, %MAC ... 23.000
FRONT SPAR LOCATION, %MAC ... 10.000
AFT SPAR LOCATION, %MAC ... 55.000
SPOILER LENGTH, IN ... 720.000
FLAP LENGTH, IN ... 720.000

TORSIONAL CHARACTERISTICS
DESIGN PYLON PITCH INERTIA, SLUG-FT2 ... 9727.797
DESIGN SHEAR MODULUS, PSI ... 4500000.000
AREA OF BOX CROSS SECTION, FT2 ... 6.721
PERIMETER OF BOX SECTION, FT ... 10.613
POLAR INERTIA OF BOX, IN4 ... 6994.855
WING TORSIONAL SPRING RATE, FT-LB/RAD ... 6526308.000

BENDING CHARACTERISTICS
DESIGN VERTICAL THRUST AT EACH TIP, LBS ... 35368.219
RESULTING JUMP TAKEOFF MOMENT, IN-LBS ... 8970138.000
DESIGN NORMAL FORCE IN AIRPLANE, LBS ... 81062.500
RESULTING ROOT MOMENT IN AIPLANE, IN-LBS ... 7695256.000
DESIGN ROOT BENDING STRESS, PSI ... 50000.000
BENDING INERTIA OF BOX, IN4 ... 2378.735

DETAIL DIMENSIONS
SPAR AND BOX PANEL SKIN THICKNESS, IN ... 0.238
(INNER + OUTER SKINS)
TOTAL BOX PANEL THICKNESS, IN ... 1.247
(INCLUDES CORE THICKNESS)
DENSITY OF BOX SKINS, LBS/CU IN ... 0.078
FUEL CAPACITY PER 100 INCHES CELL SPAN, LBS ... 2138.433

WING WEIGHT BREAKDOWN
PRIMARY STRUCTURE, LBS ... 3133.371
SECONDARY STRUCTURE, LBS ... 290.103
FLAPERONS, LBS ... 0.000
FLAPS AND SPOILERS, LBS ... 1132.171
WING FOLD FEATURE, LBS ... 0.000
OUTER PANEL PRIMARY STRUCTURE, LBS ... 189.171
OUTER PANEL SECONDARY STRUCTURE, LBS ... 140.514

WING DESIGN GOVERNED BY: ... HBENDING
ENTER 1 FOR AIRCRAFT DATA REPORT, 0 TO SKIP:
1

AIRCRAFT DATA

```
AIRCRAFT CHARACTERISTICS-
  AVAILABLE PASSENGER SEATS                              100.000
  MAXIMUM GROSS WEIGHT, LB                             64850.000
  DESIGN GROSS WEIGHT, LB                              64850.000
  WEIGHT EMPTY, LB                                     42835.000
  LIMIT FLIGHT LOAD FACTOR, G                              2.500
  OVERALL DIMENSIONS (ROTORS TURNING)-
    HELICOPTER MODE:
      LENGTH, FT                                          98.750
      WIDTH, FT                                          106.587
      HEIGHT, FT                                          30.880
      DISTANCE BETWEEN ROTOR CENTERS, FT                  62.959
    AIRPLANE MODE:
      LENGTH, FT                                          98.750
      WIDTH, FT                                          105.926
      HEIGHT, FT                                          30.880
      DISTANCE BETWEEN ROTOR CENTERS, FT                  62.298
  NEUTRAL CENTER OF GRAVITY LOCATION-
    STOL MODE: MAST 60 DEGREES
      STATION LINE, IN                                   494.497
      BUTTOCK LINE, IN                                     0.000
      WATER LINE, IN                                     214.700
    AIRPLANE MODE:
      STATION LINE, IN                                   493.396
      BUTTOCK LINE, IN                                     0.000
      WATER LINE, IN                                     209.500
  MOMENT OF INERTIA-
    HELICOPTER MODE:
      PITCH, SLG-FT2                                   387825.688
      ROLL, SLG-FT2                                    773619.125
      YAW, SLG-FT2                                    1133219.000
      CROSS(R-Y), SLG-FT2                                9413.406
    AIRPLANE MODE:
      PITCH, SLG-FT2                                   360244.438
      ROLL, SLG-FT2                                    739957.250
      YAW, SLG-FT2                                    1152304.000
      CROSS(R-Y), SLG-FT2                                5695.109
  GROUND LOCATION-
    WATER LINE, IN                                        38.426

ROTOR CHARACTERISTICS-
  HUB TYPE                                               GIMBAL
  BLADE TYPE                                       STIFF-INPLANE
  DIRECTION OF ROTATION (INBOARD TIP MOTION):
    HELICOPTER/AIRPLANE                                  AFT/UP
  NUMBER OF BLADES                                        3.000
  DISC LOADING AT DST, LB/FT2                            16.150
  BLADE LOADING COEFF. (CT/SIGMA) AT DST SL 90F           0.124
  ROTOR SPEED-
    HELICOPTER MODE:
      TIP SPEED, FT/SEC                                  700.000
      RPM                                                306.432
    AIRPLANE MODE:
      TIP SPEED, FT/SEC                                  600.000
      RPM                                                262.656
  SOLIDITY                                                 0.118
  DISC AREA PER ROTOR, FT2                              1494.928
  ROTOR DIAMETER, FT                                      43.628
  BLADE CHORD, IN                                         32.471
  BLADE TWIST(EFFECTIVE), DEG                             44.100
  DELTA THREE, DEG                                       -15.000
  BLADE FLAPPING INERTIA, SLG-FT2                       1498.338
  FLAPPING SPRING RATE, FT-LB/DEG                       1214.110
  LONG. AND LAT. FLAPPING RESTRAINT, FT-LB/DEG          1821.165
  PRECONE ANGLE, DEG                                      2.500
  BLADE INPLANE EFFECTIVE MASS, LBS                     228.294
  BLADE INPLANE MOMENT OF INERTIA, SLG-FT2              476.538
  DIST FROM VIRTUAL HINGE TO BLADE CG, FT                6.980
  DIST FROM VIRTUAL HINGE TO MAST CENTER, FT             6.946
  RAD. OF GYRATION ABOUT BLADE CG, FT                    4.363

DRIVE SYSTEM-
  ENGINE TO TILT ROTOR GEAR RATIO                        54.753
```

BELL HELICOPTER COMPANY
DESIGN SYNTHESIS PROGRAM

DESIGN POINT NUMBER 19

ENGINE TO INTERCONNECT GEAR RATIO	1.864
INTERCONNECT TO ROTOR GEAR RATIO	29.370
RATED TORQUE OF ROTOR SHAFT, FT-LB	115998.813
RATED TORQUE OF INTERCONNECT SHAFT, FT-LB	6719.473
RATED TORQUE OF ENGINE DRIVE SHAFT, FT-LB	2348.750
DRIVE SYSTEM INERTIA AT ROTOR SHAFT, SLG-FT2	11370.141

POWER PLANT-

NUMBER OF ENGINES	2.000
INTERMEDIATE RATED POWER(TOTAL-SLS), HP	12009.898
POWER LOADING AT DGW, LB/HP	5.400
EMERGENCY POWER RATING(PER ENGINE-SL, 90F), HP	6168.281
ENGINE TORQUE AT EMERGENCY RATING, FT-LB	1930.109
MAX. CONT. POWER RATING(PER ENGINE-SLS), HP	5482.516

POD CHARACTERISTICS-
CONVERSION PIVOT LOCATION:

STATION LINE, IN	472.800
BUTTOCK LINE, IN	373.788
WATER LINE, IN	250.000
DISTANCE BETWEEN PIVOT AND HUB CENTER, IN	90.928
POD LENGTH AHEAD OF PIVOT, IN	158.988
POD LENGTH AFT OF PIVOT, IN	130.000
POD WIDTH, IN	49.018
POD HEIGHT, IN	76.170
POD WEIGHT (EACH), LBS	7044.332
DISTANCE FROM PIVOT TO POD CG, IN	25.290

WING-

WING LOADING AT DGW, LB/FT2	85.000
WING AREA, FT2	762.941
FLAP AREA(TOTAL), FT2	204.399
SPOILER AREA(TOTAL), FT2	78.615
WING SPAN, FT	87.346

WING MEAN AERODYNAMIC CHORD:

CHORD, FT	8.735
STATION LINE(1/4 MAC), IN	493.396
BUTTOCK LINE(1/4 MAC), IN	246.221
WATER LINE(1/4 MAC), IN	240.849
LEADING EDGE STATION, IN	467.192
TRAILING EDGE STATION, IN	572.008
ASPECT RATIO	10.000
TAPER RATIO	1.370
SWEEP, DEG	0.000
DIHEDRAL, DEG	2.000
INCIDENCE, DEG	4.000
AIRFOIL THICKNESS, % MAC	23.000
MAXIMUM THICKNESS LOCATION, % MAC	40.000
FRONT SPAR STATION AT FUSELAGE, IN	477.674
AFT SPAR STATION AT FUSELAGE, IN	535.325

TAIL-
HORIZONTAL:

VOLUME COEFFICIENT	1.639
ASPECT RATIO	3.745
HORIZONTAL TAIL ARM, FT	51.465
AREA, FT2	212.235
SPAN, FT	28.193
MEAN AERODYNAMIC CHORD, FT	7.528
1/4 MAC STATION LINE, IN	1110.976
1/4 MAC BUTTOCK LINE, IN	84.579
1/4 MAC WATER LINE, IN	287.500
SWEEP(MAX THICKNESS), DEG	0.000
ELEVATOR AREA, FT2	63.870

VERTICAL:

NUMBER OF FINS	2.000
VOLUME COEFFICIENT	0.130
ASPECT RATIO(EACH)	2.440
VERTICAL TAIL ARM, FT	52.288
AREA(TOTAL), FT2	165.796
SPAN(EACH), FT	14.222
MEAN AERODYNAMIC CHORD, FT	5.828
1/4 MAC STATION LINE, IN	1120.852
1/4 MAC BUTTOCK LINE, IN	169.158
1/4 MAC WATER LINE, IN	330.000
SWEEP(UPPER PANEL, MAX THICKNESS), DEG	13.672
RUDDER AREA, FT2	48.444

DESIGN POINT NUMBER 19

FUSELAGE-
```
  MOST FORWARD STATION LINE, IN _____          30.000
  MOST AFT STATION LINE, IN                                     1180.000
  TOP STRINGER WATER LINE, IN                                    238.466
  BOTTOM STRINGER WATER LINE, IN                                  68.426
  MAX WIDTH BUTTOCK LINE, IN___                                  100.020
  LENGTH, FT                                                      95.833
  WIDTH, FT                                                       16.670
  HEIGHT, FT                                                      14.170
```

LANDING GEAR-
```
  ULTIMATE LANDING LOAD FACTOR,  G                                 5.250
  LANDING SPEED,  KNOTS                                           80.000
  NOSE(TURN CENTER GROUND LEVEL):
     STATION LINE, IN                                             80.000
  MAIN(EFFECTIVE CENTER GROUND LEVEL):
     STATION LINE, IN                                            568.509
     BUTTOCK LINE, IN                                            121.693
  TAIL BUMPER
     STATION LINE, IN                                           1140.000
     WATER LINE, IN                                              177.508
```

ANALYSIS COMPLETED FOR PT NO 19

ENTER OPTION TO READ NEW ARRAYS:
1

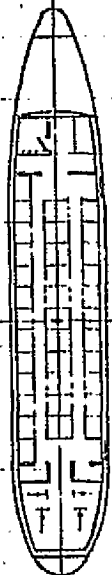ENTER 0 TO SKIP DESIGN DATA AND GO DIRECTLY TO TECHNOLOGY DATA:

DIMENSIONS FOR 45-PASSENGER FUSELAGE

45 PAX

PASSENGER PAYLOAD = 8100 lbs.
(SEE Pg. 13)

PASSENGER CABIN
(470")

45 PASSENGER FUSELAGE
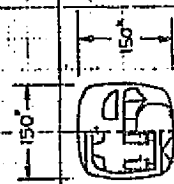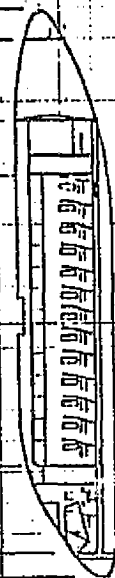
FUSELAGE STATIONS (IN.)

0 100 200 300 400 500 600 700 800 900 1000

FS 15 30 70   210   440   690 770 900 945

WL 600 400 200 FS 0 200 400 600

BUTTOCK LINES (IN.)

600—500—400—300—200—100   0   100—200—300—400—500—600

150°   150°   30°

45 PAX
4 ENG

D313-099-002

BELL HELICOPTER COMPANY
DESIGN SYNTHESIS PROGRAM

DESIGN POINT NUMBER 11
DGW = 36975

COMPONENT ZERO-LIFT DRAG, AIRPLANE, FLAPS UP

WING	HUR	VERT	FUS	NAC	BOOMS	EXT	MISC	TOTAL
4.35	1.50	1.16	7.06	2.15	0.00	2.00	0.00	18.22

DRAG WITH LIFT, AIRPLANE, FLAPS UP

ALPHA	CL	CD	CLWP	CLH	CLPRP	CDWP	CDF	CDH
-4.00000	-0.19098	0.04167	-0.07022	-0.11785	-0.00291	0.01249	0.01799	0.00520
-2.00000	0.01777	0.03733	0.10532	-0.08625	-0.00130	0.01272	0.01452	0.00410
0.00000	0.22623	0.03789	0.28086	-0.05464	0.00000	0.01519	0.01336	0.00334
2.00000	0.43489	0.04335	0.45640	-0.02303	0.00151	0.01992	0.01452	0.00292
4.00000	0.64428	0.05372	0.63194	0.00858	0.00376	0.02689	0.01799	0.00285
6.00000	0.85492	0.06898	0.80748	0.04019	0.00725	0.03611	0.02377	0.00311
8.00000	1.06734	0.08916	0.98302	0.07180	0.01253	0.04759	0.03187	0.00371
10.00000	1.28210	0.11423	1.15856	0.10341	0.02014	0.06131	0.04228	0.00465
12.00000	1.49976	0.14421	1.33409	0.13502	0.03065	0.07728	0.05501	0.00594
14.00000	1.72091	0.17910	1.50963	0.16662	0.04465	0.09550	0.07005	0.00756

SPEED POWER DATA-AIRPLANE

GW = 36975   ALT= 0   TEMP= 59   OMGR= 600

V =	134.3	154.3	174.3	194.3	214.3	234.3	254.3	274.3	294.3
ALPHA =	8.734	6.124	4.343	3.076	2.145	1.441	0.895	0.465	0.119

DESIGN POINT NUMBER 11

CL =	1.146	0.868	0.680	0.547	0.450	0.376	0.320	0.275	0.239
CD =	0.0978	0.0701	0.0560	0.0483	0.0439	0.0413	0.0397	0.0387	0.0381
F =	52.3	37.2	29.7	25.6	23.2	21.8	21.0	20.5	20.1
PROPCL=	0.0943	0.0854	0.0833	0.0857	0.0908	0.0979	0.1064	0.1157	0.1258
PROPCD=	0.0098	0.0103	0.0108	0.0112	0.0115	0.0119	0.0121	0.0124	0.0128
PROPN =	78.9	77.6	77.2	77.4	78.0	78.8	79.7	80.4	80.8
PWREQD=	1764	1938	2237	2663	3220	3917	4761	5770	6968
UTLHP =	4140								
NORMPW=	4880	4922	4968	5018	5068	5118	5171	5233	5308
L/D =	8.6	9.0	8.8	8.3	7.6	6.8	6.1	5.4	4.8
SFC =	0.5346	0.5122	0.4833	0.4574	0.4342	0.4156	0.4055	0.3974	0.3939
FF =	943	992	1081	1218	1398	1628	1931	2293	2745

VMC=Q LIMITED
VMCX = 239.3
FF = 1696.2

SPEED POWER DATA-AIRPLANE

GW =	46219	ALT=	5000	TEMP=	41	OMGR=	540		
V =	161.8	181.8	201.8	221.8	241.8	261.8	281.8	301.8	
ALPHA =	8.734	6.497	4.878	3.671	2.747	2.026	1.452	0.988	
CL =	1.146	0.908	0.737	0.610	0.513	0.438	0.378	0.329	
CD =	0.0978	0.0735	0.0598	0.0517	0.0466	0.0435	0.0414	0.0400	
F =	52.3	39.1	31.7	27.3	24.7	23.0	21.9	21.1	
PROPCL=	0.1545	0.1394	0.1330	0.1323	0.1354	0.1413	0.1490	0.1580	
PROPCD=	0.0108	0.0112	0.0116	0.0120	0.0122	0.0124	0.0127	0.0132	
PROPN =	85.9	84.5	83.6	83.1	82.9	83.0	83.2	83.1	
PWREQD=	2440	2630	2951	3401	3981	4698	5567	6613	
UTLHP =	3726								
NORMPW=	4355	4400	4448	4495	4545	4600	4664	4739	
L/D =	9.4	9.8	9.7	9.2	8.6	7.9	7.2	6.5	
SFC =	0.4469	0.4377	0.4263	0.4178	0.4130	0.4079	0.4073	0.4077	
FF =	1090	1151	1258	1421	1644	1916	2268	2696	

SPEED POWER DATA-AIRPLANE

GW =	36975	ALT=	5000	TEMP=	41	OMGR=	540		
V =	144.7	164.7	184.7	204.7	224.7	244.7	264.7	284.7	304.7
ALPHA =	8.734	6.279	4.561	3.316	2.385	1.672	1.114	0.669	0.309
CL =	1.146	0.884	0.703	0.573	0.475	0.401	0.342	0.296	0.258
CD =	0.0978	0.0715	0.0575	0.0496	0.0450	0.0421	0.0403	0.0392	0.0384
F =	52.3	38.0	30.5	26.3	23.8	22.3	21.3	20.7	20.3
PROPCL=	0.1284	0.1156	0.1114	0.1126	0.1172	0.1243	0.1331	0.1430	0.1538
PROPCD=	0.0104	0.0108	0.0113	0.0117	0.0120	0.0122	0.0124	0.0127	0.0132
PROPN =	83.7	82.3	81.5	81.2	81.3	81.7	82.2	82.5	82.6
PWREQD=	1790	1952	2230	2625	3140	3779	4552	5476	6578
UTLHP =	3726								
NORMPW=	4319	4361	4407	4455	4502	4553	4609	4674	4751
L/D =	9.2	9.6	9.4	8.8	8.1	7.3	6.6	5.9	5.3
SFC =	0.4825	0.4688	0.4526	0.4354	0.4208	0.4137	0.4079	0.4069	0.4072
FF =	864	915	1009	1143	1321	1564	1857	2228	2679

SPEED POWER DATA-AIRPLANE

GW =	27731	ALT=	5000	TEMP=	41	OMGR=	540			
V =	125.3	145.3	165.3	185.3	205.3	225.3	245.3	265.3	285.3	305.3
ALPHA =	8.734	5.974	4.135	2.852	1.923	1.229	0.698	0.282	-0.050	-0.319
CL =	1.146	0.852	0.658	0.524	0.427	0.354	0.299	0.256	0.221	0.193
CD =	0.0978	0.0688	0.0546	0.0472	0.0430	0.0407	0.0392	0.0384	0.0378	0.0375
F =	52.3	36.5	28.9	24.9	22.8	21.5	20.7	20.3	20.0	19.8
PROPCL=	0.1004	0.0904	0.0885	0.0917	0.0980	0.1064	0.1162	0.1270	0.1385	0.1504
PROPCD=	0.0098	0.0103	0.0108	0.0113	0.0117	0.0120	0.0122	0.0124	0.0127	0.0132
PROPN =	80.1	78.7	78.3	78.5	79.1	79.9	80.7	81.5	82.1	82.3
PWREQD=	1216	1347	1579	1914	2357	2914	3589	4395	5350	6481
UTLHP =	3726									
NORMPW=	4282	4320	4363	4408	4456	4504	4554	4611	4676	4753
L/D =	8.8	9.2	8.9	8.2	7.4	6.6	5.8	5.1	4.5	4.0
SFC =	0.5608	0.5368	0.5034	0.4695	0.4453	0.4251	0.4147	0.4083	0.4063	0.4067
FF =	682	723	795	899	1050	1238	1488	1795	2174	2636

SPEED POWER DATA-AIRPLANE

GW =	18488	ALT=	5000	TEMP=	41	OMGR=	540			
V =	102.3	122.3	142.3	162.3	182.3	202.3	222.3	242.3	262.3	282.3	302.3
ALPHA =	8.734	5.497	3.504	2.195	1.291	0.641	0.158	-0.210	-0.498	-0.727	-0.911
CL =	1.146	0.802	0.592	0.455	0.361	0.293	0.243	0.204	0.174	0.150	0.131
CD =	0.0978	0.0647	0.0507	0.0441	0.0409	0.0391	0.0381	0.0376	0.0373	0.0371	0.0370
F =	52.3	34.3	26.8	23.3	21.6	20.7	20.1	19.9	19.7	19.6	19.6
PROPCL=	0.0701	0.0632	0.0641	0.0693	0.0773	0.0870	0.0978	0.1094	0.1215	0.1340	0.1467
PROPCD=	0.0091	0.0097	0.0102	0.0107	0.0112	0.0116	0.0119	0.0122	0.0124	0.0126	0.0131
PROPN =	73.1	72.1	72.6	74.0	75.7	77.2	78.6	79.9	80.9	81.7	82.1

DESIGN POINT NUMBER 11

PWREQD=	725	825	1008	1276	1637	2098	2667	3350	4158	5110	6231
UTLHP =	3726										
NORMPW=	4244	4277	4314	4356	4401	4449	4497	4547	4602	4666	4741
L/D =	8.0	8.4	8.0	7.2	6.3	5.5	4.7	4.1	3.6	3.1	2.8
SFC =	0.6987	0.6581	0.6039	0.5467	0.4951	0.4567	0.4323	0.4166	0.4099	0.4062	0.4063
FF =	506	543	609	698	810	958	1153	1395	1704	2075	2532

SPEED POWER DATA-AIRPLANE

GW = 46219   ALT= 2000   TEMP= 52   OMGR= 540

V =	154.6	174.6	194.6	214.6	234.6	254.6	274.6	294.6			
ALPHA =	8.734	6.411	4.752	3.528	2.601	1.882	1.314	0.858			
CL =	1.146	0.898	0.723	0.595	0.498	0.423	0.363	0.316			
CD =	0.0978	0.0727	0.0589	0.0508	0.0459	0.0429	0.0409	0.0396			
F =	52.3	38.7	31.2	26.9	24.3	22.7	21.6	20.9			
PROPCL=	0.1435	0.1293	0.1238	0.1239	0.1277	0.1341	0.1422	0.1517			
PROPCD=	0.0106	0.0110	0.0115	0.0118	0.0121	0.0123	0.0126	0.0129			
PROPN =	85.1	83.7	82.8	82.4	82.3	82.5	82.8	83.0			
PWREQD=	2354	2548	2879	3346	3951	4700	5605	6688			
UTLHP =	3726										
NORMPW=	4614	4658	4706	4754	4802	4854	4913	4985			
L/D =	9.3	9.7	9.6	9.1	8.4	7.7	6.9	6.2			
SFC =	0.4622	0.4528	0.4399	0.4257	0.4174	0.4121	0.4085	0.4087			
FF =	1088	1154	1266	1424	1649	1937	2290	2734			

SPEED POWER DATA-AIRPLANE

GW = 36975   ALT= 2000   TEMP= 52   OMGR= 540

V =	138.3	158.3	178.3	198.3	218.3	238.3	258.3	278.3	298.3		
ALPHA =	8.734	6.186	4.430	3.171	2.240	1.532	0.981	0.545	0.193		
CL =	1.146	0.875	0.689	0.557	0.460	0.386	0.329	0.283	0.246		
CD =	0.0978	0.0707	0.0566	0.0488	0.0443	0.0416	0.0400	0.0389	0.0382		
F =	52.3	37.5	30.0	25.8	23.4	22.0	21.1	20.5	20.2		
PROPCL=	0.1190	0.1071	0.1037	0.1055	0.1107	0.1183	0.1274	0.1376	0.1487		
PROPCD=	0.0102	0.0106	0.0111	0.0115	0.0119	0.0121	0.0123	0.0126	0.0130		
PROPN =	82.7	81.3	80.6	80.5	80.7	81.1	81.7	82.3	82.5		
PWREQD=	1732	1898	2185	2595	3132	3802	4612	5578	6724		
UTLHP =	3726										
NORMPW=	4581	4622	4667	4715	4763	4811	4864	4926	5000		
L/D =	9.1	9.5	9.3	8.7	7.9	7.1	6.4	5.7	5.0		
SFC =	0.5104	0.4919	0.4684	0.4486	0.4300	0.4181	0.4122	0.4082	0.4084		
FF =	884	934	1023	1164	1347	1590	1901	2277	2746		

SPEED POWER DATA-AIRPLANE

GW = 27731   ALT= 2000   TEMP= 52   OMGR= 540

V =	119.8	139.8	159.8	179.8	199.8	219.8	239.8	259.8	279.8	299.8	
ALPHA =	8.734	5.872	3.997	2.706	1.780	1.095	0.573	0.167	-0.155	-0.415	
CL =	1.146	0.841	0.644	0.509	0.412	0.340	0.286	0.244	0.210	0.183	
CD =	0.0978	0.0679	0.0537	0.0464	0.0425	0.0403	0.0389	0.0382	0.0377	0.0374	
F =	52.3	36.0	28.4	24.6	22.5	21.3	20.6	20.2	19.9	19.7	
PROPCL=	0.0928	0.0835	0.0824	0.0860	0.0928	0.1015	0.1116	0.1226	0.1343	0.1464	
PROPCD=	0.0097	0.0102	0.0107	0.0111	0.0115	0.0119	0.0121	0.0123	0.0126	0.0130	
PROPN =	78.8	77.5	77.2	77.6	78.4	79.3	80.3	81.2	81.9	82.3	
PWREQD=	1182	1317	1557	1905	2368	2951	3662	4511	5514	6697	
UTLHP =	3726										
NORMPW=	4546	4583	4625	4670	4718	4766	4815	4868	4931	5005	
L/D =	8.6	9.0	8.7	8.0	7.2	6.3	5.6	4.9	4.3	3.8	
SFC =	0.5950	0.5676	0.5298	0.4895	0.4573	0.4349	0.4190	0.4126	0.4080	0.4081	
FF =	703	747	825	933	1083	1284	1534	1861	2250	2733	

SPEED POWER DATA-AIRPLANE

GW = 18488   ALT= 2000   TEMP= 52   OMGR= 540

V =	97.8	117.8	137.8	157.8	177.8	197.8	217.8	237.8	257.8	277.8	297.8
ALPHA =	8.734	5.383	3.360	2.050	1.155	0.517	0.046	-0.311	-0.588	-0.808	-0.985
CL =	1.146	0.790	0.577	0.440	0.347	0.280	0.231	0.194	0.165	0.142	0.124
CD =	0.0978	0.0638	0.0499	0.0435	0.0404	0.0388	0.0380	0.0375	0.0372	0.0371	0.0370
F =	52.3	33.8	26.4	23.0	21.4	20.5	20.0	19.8	19.7	19.6	19.5
PROPCL=	0.0647	0.0584	0.0597	0.0653	0.0736	0.0834	0.0944	0.1061	0.1183	0.1309	0.1437
PROPCD=	0.0090	0.0096	0.0101	0.0106	0.0111	0.0115	0.0118	0.0121	0.0123	0.0125	0.0129
PROPN =	71.2	70.4	71.2	73.0	74.9	76.6	78.2	79.5	80.7	81.6	82.1
PWREQD=	711	814	1004	1284	1662	2146	2746	3468	4325	5332	6514
UTLHP =	3726										
NORMPW=	4512	4543	4580	4621	4666	4713	4761	4810	4863	4924	4997
L/D =	7.8	8.2	7.8	7.0	6.1	5.2	4.5	3.9	3.4	3.0	2.6
SFC =	0.7396	0.6945	0.6334	0.5713	0.5149	0.4692	0.4418	0.4216	0.4136	0.4081	0.4080
FF =	526	566	636	734	856	1007	1213	1462	1789	2176	2658

SPEED POWER DATA-AIRPLANE

GW = 46219   ALT= 10000   TEMP= 23   OMGR= 600

DESIGN POINT NUMBER 11

V =	174.8	194.8	214.8	234.8	254.8	274.8	294.8
ALPHA =	8.734	6.639	5.089	3.911	2.997	2.274	1.693
CL =	1.146	0.923	0.759	0.635	0.539	0.464	0.403
CD =	0.0978	0.0749	0.0614	0.0532	0.0479	0.0445	0.0422
F =	52.3	39.8	32.6	28.1	25.3	23.5	22.3
PROPCL=	0.1475	0.1340	0.1278	0.1266	0.1288	0.1334	0.1397
PROPCD=	0.0109	0.0113	0.0116	0.0120	0.0124	0.0129	0.0132
PROPN =	85.1	83.9	83.0	82.5	82.2	81.9	81.9
PWREQD=	2659	2846	3153	3581	4136	4829	5654
UTLHP =	4140						
NORMPW=	4041	4090	4140	4193	4251	4315	4388
L/D =	9.3	9.7	9.7	9.3	8.7	8.1	7.4
SFC =	0.4187	0.4128	0.4068	0.3995	0.3938	0.3905	0.3881
FF =	1113	1175	1282	1430	1629	1885	2194

SPEED POWER DATA-AIRPLANE

GW = 36975   ALT= 10000   TEMP= 23   OMGR= 600

V =	156.3	176.3	196.3	216.3	236.3	256.3	276.3	296.3	316.3
ALPHA =	8.734	6.432	4.782	3.562	2.636	1.916	1.347	0.888	0.514
CL =	1.146	0.901	0.726	0.598	0.501	0.426	0.367	0.319	0.280
CD =	0.0978	0.0729	0.0591	0.0510	0.0461	0.0430	0.0410	0.0397	0.0388
F =	52.3	38.8	31.3	27.0	24.4	22.7	21.7	21.0	20.5
PROPCL=	0.1225	0.1110	0.1068	0.1072	0.1108	0.1166	0.1240	0.1324	0.1418
PROPCD=	0.0104	0.0109	0.0112	0.0116	0.0120	0.0123	0.0128	0.0132	0.0144
PROPN =	82.8	81.6	80.8	80.6	80.6	80.8	80.9	81.1	80.6
PWREQD=	1955	2113	2379	2753	3239	3846	4588	5457	6533
UTLHP =	4140								
NORMPW=	3999	4045	4094	4144	4198	4255	4320	4394	4474
L/D =	9.1	9.5	9.4	8.9	8.3	7.6	6.8	6.2	5.5
SFC =	0.4515	0.4398	0.4251	0.4128	0.4039	0.3950	0.3908	0.3877	0.3884
FF =	883	930	1011	1136	1308	1519	1793	2116	2537

SPEED POWER DATA-AIRPLANE

GW = 27731   ALT= 10000   TEMP= 23   OMGR= 600

V =	135.4	155.4	175.4	195.4	215.4	235.4	255.4	275.4	295.4	315.4
ALPHA =	8.734	6.141	4.366	3.102	2.170	1.465	0.918	0.486	0.139	-0.145
CL =	1.146	0.870	0.683	0.550	0.453	0.379	0.322	0.277	0.241	0.211
CD =	0.0978	0.0702	0.0561	0.0485	0.0440	0.0414	0.0398	0.0388	0.0381	0.0377
F =	52.3	37.3	29.7	25.6	23.3	21.9	21.0	20.5	20.1	19.9
PROPCL=	0.0956	0.0866	0.0844	0.0867	0.0918	0.0988	0.1072	0.1165	0.1265	0.1370
PROPCD=	0.0099	0.0104	0.0108	0.0112	0.0116	0.0119	0.0123	0.0128	0.0132	0.0142
PROPN =	79.0	77.7	77.3	77.6	78.1	78.8	79.5	80.0	80.5	80.3
PWREQD=	1331	1460	1683	2000	2415	2936	3571	4336	5225	6310
UTLHP =	4140									
NORMPW=	3956	3997	4043	4092	4142	4195	4253	4317	4390	4470
L/D =	8.7	9.1	8.9	8.3	7.6	6.8	6.1	5.4	4.8	4.3
SFC =	0.5110	0.4911	0.4675	0.4447	0.4218	0.4078	0.3978	0.3914	0.3878	0.3874
FF =	680	717	787	889	1019	1197	1420	1697	2026	2445

SPEED POWER DATA-AIRPLANE

GW = 18488   ALT= 10000   TEMP= 23   OMGR= 600

V =	110.5	130.5	150.5	170.5	190.5	210.5	230.5	250.5	270.5	290.5	310.5
ALPHA =	8.734	5.685	3.748	2.445	1.528	0.859	0.357	-0.031	-0.335	-0.579	-0.778
CL =	1.146	0.822	0.618	0.481	0.386	0.316	0.263	0.223	0.191	0.166	0.145
CD =	0.0978	0.0663	0.0521	0.0452	0.0416	0.0396	0.0385	0.0378	0.0374	0.0372	0.0371
F =	52.3	35.2	27.6	23.9	22.0	20.9	20.3	20.0	19.8	19.7	19.6
PROPCL=	0.0667	0.0604	0.0607	0.0648	0.0714	0.0797	0.0890	0.0991	0.1097	0.1207	0.1320
PROPCD=	0.0091	0.0097	0.0102	0.0107	0.0111	0.0115	0.0118	0.0122	0.0126	0.0130	0.0138
PROPN =	71.7	70.7	71.2	72.5	74.2	75.8	77.2	78.4	79.3	80.0	80.2
PWREQD=	798	897	1073	1327	1664	2091	2617	3250	4007	4887	5932
UTLHP =	4140										
NORMPW=	3910	3946	3987	4032	4079	4130	4182	4238	4301	4371	4450
L/D =	7.9	8.3	8.0	7.3	6.5	5.7	5.0	4.4	3.8	3.4	3.0
SFC =	0.6494	0.6122	0.5611	0.5092	0.4676	0.4377	0.4148	0.4025	0.3927	0.3888	0.3865
FF =	518	549	602	676	778	915	1086	1308	1573	1900	2293

SPEED POWER DATA-AIRPLANE

GW = 46219   ALT= 20000   TEMP= -12   OMGR= 600

V =	205.8	225.8	245.8	265.8	285.8
ALPHA =	8.734	6.915	5.511	4.406	3.522
CL =	1.146	0.952	0.803	0.687	0.594
CD =	0.0978	0.0776	0.0648	0.0564	0.0508
F =	52.3	41.3	34.4	29.9	26.9
PROPCL=	0.1919	0.1751	0.1657	0.1616	0.1613
PROPCD=	0.0118	0.0123	0.0128	0.0132	0.0141
PROPN =	87.5	86.2	85.0	84.3	83.2
PWREQD=	3045	3224	3513	3897	4414

BELL HELICOPTER COMPANY
DESIGN SYNTHESIS PROGRAM

DESIGN POINT NUMBER 11

UTLHP =	4140				
NORMPW=	3206	3257	3312	3371	3434
L/D =	9.6	9.9	9.9	9.7	9.2
SFC =	0.3906	0.3886	0.3868	0.3858	0.3868
FF =	1190	1253	1359	1503	1707

SPEED POWER DATA-AIRPLANE

GW =	36975	ALT=	20000	TEMP=	-12	OMGR=	600		
V =	184.1	204.1	224.1	244.1	264.1	284.1	304.1		
ALPHA =	8.734	6.730	5.226	4.071	3.165	2.442	1.856		
CL =	1.146	0.932	0.773	0.652	0.557	0.481	0.420		
CD =	0.0978	0.0758	0.0625	0.0542	0.0488	0.0452	0.0428		
F =	52.3	40.3	33.1	28.7	25.8	23.9	22.6		
PROPCL=	0.1605	0.1460	0.1389	0.1368	0.1382	0.1422	0.1480		
PROPCD=	0.0112	0.0116	0.0120	0.0126	0.0130	0.0137	0.0160		
PROPN =	85.9	84.7	83.7	82.8	82.4	81.8	79.8		
PWREQD=	2219	2366	2607	2945	3374	3920	4662		
UTLHP =	4140								
NORMPW=	3154	3201	3252	3307	3366	3428	3494		
L/D =	9.4	9.8	9.8	9.4	8.9	8.2	7.4		
SFC =	0.4034	0.3983	0.3930	0.3892	0.3858	0.3838	0.3866		
FF =	826	942	1025	1146	1302	1505	1802		

SPEED POWER DATA-AIRPLANE

GW =	27731	ALT=	20000	TEMP=	-12	OMGR=	600		
V =	159.4	179.4	199.4	219.4	239.4	259.4	279.4	299.4	319.4
ALPHA =	8.734	6.469	4.837	3.624	2.699	1.979	1.407	0.945	0.567
CL =	1.146	0.905	0.732	0.605	0.508	0.433	0.373	0.325	0.285
CD =	0.0978	0.0733	0.0595	0.0514	0.0464	0.0433	0.0412	0.0399	0.0389
F =	52.3	39.0	31.5	27.2	24.5	22.9	21.8	21.1	20.6
PROPCL=	0.1266	0.1148	0.1102	0.1104	0.1137	0.1193	0.1265	0.1349	0.1441
PROPCD=	0.0106	0.0110	0.0113	0.0118	0.0123	0.0128	0.0133	0.0151	0.0183
PROPN =	83.2	82.0	81.2	80.8	80.5	80.6	80.6	79.3	76.8
PWREQD=	1488	1605	1802	2081	2447	2898	3449	4170	5107
UTLHP =	4140								
NORMPW=	3101	3144	3190	3240	3294	3352	3413	3478	3547
L/D =	9.1	9.5	9.4	9.0	8.3	7.6	6.9	6.1	5.3
SFC =	0.4326	0.4230	0.4125	0.4035	0.3940	0.3883	0.3841	0.3828	0.3904
FF =	644	679	744	840	964	1125	1325	1596	1994

SPEED POWER DATA-AIRPLANE

GW =	18488	ALT=	20000	TEMP=	-12	OMGR=	600		
V =	130.1	150.1	170.1	190.1	210.1	230.1	250.1	270.1	290.1	310.1
ALPHA =	8.734	6.057	4.249	2.975	2.044	1.344	0.805	0.381	0.041	-0.235
CL =	1.146	0.861	0.670	0.537	0.439	0.366	0.310	0.266	0.231	0.202
CD =	0.0978	0.0695	0.0553	0.0478	0.0435	0.0410	0.0395	0.0385	0.0379	0.0376
F =	52.3	36.9	29.3	25.3	23.0	21.7	20.9	20.4	20.0	19.8
PROPCL=	0.0893	0.0808	0.0792	0.0818	0.0873	0.0946	0.1032	0.1127	0.1229	0.1335
PROPCD=	0.0098	0.0102	0.0107	0.0111	0.0115	0.0120	0.0125	0.0129	0.0140	0.0164
PROPN =	77.7	76.5	76.2	76.6	77.3	78.0	78.6	79.4	79.2	77.5
PWREQD=	867	956	1108	1327	1616	1981	2430	2960	3617	4467
UTLHP =	4140									
NORMPW=	3046	3082	3123	3168	3216	3269	3325	3384	3448	3515
L/D =	8.5	8.9	8.7	8.1	7.4	6.6	5.8	5.2	4.6	3.9
SFC =	0.5146	0.4939	0.4684	0.4429	0.4196	0.4051	0.3933	0.3870	0.3826	0.3835
FF =	446	472	519	588	678	803	956	1145	1384	1713

CLIMB DATA-AIRPLANE, DGW

GW =36975.0000	ALT= 0.0000	TEMP= 59.0000	OMGR= 600.0000
V = 134.2996	VGND= 132.9098	ALPHA= 8.3965	ALPHAC= 8.2499
PROPNL= 0.7886	CL= 1.1097	CD= 0.0937	DCD= 0.1644
PROPNC= 0.8871	PROPCL= 0.2488	PROPCD= 0.0106	THPR= 3470.3999
THPAP = 4472.6836	THPAQ= 3472.8711	INTMPA= 5331.4170	PWRCL= 4139.6445
RC = 1951.5200	SFC = 0.4221	FF= 1747.3594	

CLIMB DATA-AIRPLANE, DGW

GW =36975.0000	ALT= 0.0000	TEMP= 59.0000	OMGR= 600.0000
V = 134.2996	VGND= 132.9098	ALPHA= 8.3965	ALPHAC= 8.2499
PROPNL= 0.7886	CL= 1.1097	CD= 0.0937	DCD= 0.1644
PROPNC= 0.8871	PROPCL= 0.2488	PROPCD= 0.0106	THPR= 3470.3999
THPAP = 4472.6836	THPAQ= 3472.8711	INTMPA= 5331.4170	PWRCL= 4139.6445
RC = 1951.5200	SFC = 0.4221	FF= 1747.3594	

CLIMB DATA-AIRPLANE, DGW

GW =36975.0000	ALT= 5000.0000	TEMP= 41.1710	OMGR= 600.0000
V = 144.6918	VGND= 143.4977	ALPHA= 8.4419	ALPHAC= 7.3662
PROPNL= 0.8096	CL= 1.1146	CD= 0.0943	DCD= 0.1469

DESIGN POINT NUMBER 11

```
PROPNC=    0.8928    PROPCL=    0.2645    PROPCD=    0.0111    THPR= 3493.5435
THPAP = 4056.7039    THPAQ= 3495.3127    INTMPA= 4804.5244    PWRCL= 4139.6445
RC    = 1878.6277    SFC   =    0.4108    FF=     1700.7686
```

```
CLIMB DATA-AIRPLANE, DGW
GW    =36975.0000     ALT= 5000.0000     TEMP=     41.1710    OMGR=   600.0000
V     =  144.6918     VGND=  143.4977     ALPHA=     8.4419    ALPHAC=    7.3662
PROPNL=    0.8096     CL=      1.1146     CD=        0.0943    DCD=       0.1469
PROPNC=    0.8928     PROPCL=    0.2645   PROPCD=    0.0111    THPR= 3493.5435
THPAP = 4056.7039     THPAQ= 3495.3127    INTMPA= 4804.5244    PWRCL= 4139.6445
RC    = 1878.6277     SFC   =    0.4108    FF=     1700.7686
```

```
CLIMB DATA-AIRPLANE, DGW
GW    =36975.0000     ALT=10000.0000     TEMP=     23.3420    OMGR=   600.0000
V     =  156.3099     VGND=  155.3058     ALPHA=     8.4845    ALPHAC=    6.4980
PROPNL=    0.8283     CL=      1.1192     CD=        0.0948    DCD=       0.1297
PROPNC=    0.8975     PROPCL=    0.2809   PROPCD=    0.0116    THPR= 3512.6436
THPAP = 3643.0217     THPAQ= 3513.8401    INTMPA= 4291.8340    PWRCL= 4139.6445
RC    = 1791.3643     SFC   =    0.4008    FF=     1659.2197
```

```
CLIMB DATA-AIRPLANE, DGW
GW    =36975.0000     ALT=10000.0000     TEMP=     23.3420    OMGR=   600.0000
V     =  156.3099     VGND=  155.3058     ALPHA=     8.4845    ALPHAC=    6.4980
PROPNL=    0.8283     CL=      1.1192     CD=        0.0948    DCD=       0.1297
PROPNC=    0.8975     PROPCL=    0.2809   PROPCD=    0.0116    THPR= 3512.6436
THPAP = 3643.0217     THPAQ= 3513.8401    INTMPA= 4291.8340    PWRCL= 4139.6445
RC    = 1791.3643     SFC   =    0.4008    FF=     1659.2197
```

```
CLIMB DATA-AIRPLANE, DGW
GW    =36975.0000     ALT=15000.0000     TEMP=      5.5130    OMGR=   600.0000
V     =  169.3525     VGND=  168.7767     ALPHA=     8.5647    ALPHAC=    4.7260
PROPNL=    0.8449     CL=      1.1277     CD=        0.0957    DCD=       0.0944
PROPNC=    0.8983     PROPCL=    0.2722   PROPCD=    0.0118    THPR= 3224.7180
THPAP = 3225.5891     THPAQ= 3516.8281    INTMPA= 3796.8291    PWRCL= 3796.8281
RC    = 1412.9944     SFC   =    0.3952    FF=     1500.3271
```

```
CLIMB DATA-AIRPLANE, DGW
GW    =36975.0000     ALT=15000.0000     TEMP=      5.5130    OMGR=   600.0000
V     =  169.3525     VGND=  168.7767     ALPHA=     8.5647    ALPHAC=    4.7260
PROPNL=    0.8449     CL=      1.1277     CD=        0.0957    DCD=       0.0944
PROPNC=    0.8983     PROPCL=    0.2722   PROPCD=    0.0118    THPR= 3224.7180
THPAP = 3225.5891     THPAQ= 3516.8281    INTMPA= 3796.8291    PWRCL= 3796.8281
RC    = 1412.9944     SFC   =    0.3952    FF=     1500.3271
```

```
CLIMB DATA-AIRPLANE, DGW
GW    =36975.0000     ALT=20000.0000     TEMP=    -12.3160    OMGR=   600.0000
V     =  184.0588     VGND=  183.8340     ALPHA=     8.6404    ALPHAC=    2.8315
PROPNL=    0.8593     CL=      1.1358     CD=        0.0967    DCD=       0.0566
PROPNC=    0.8959     PROPCL=    0.2515   PROPCD=    0.0118    THPR= 2825.3489
THPAP = 2826.0222     THPAQ= 3507.4780    INTMPA= 3335.3682    PWRCL= 3335.3672
RC    =  920.7468     SFC   =    0.3901    FF=     1301.1270
```

```
CLIMB DATA-AIRPLANE, DGW
GW    =36975.0000     ALT=20000.0000     TEMP=    -12.3160    OMGR=   600.0000
V     =  184.0588     VGND=  183.8340     ALPHA=     8.6404    ALPHAC=    2.8315
PROPNL=    0.8593     CL=      1.1358     CD=        0.0967    DCD=       0.0566
PROPNC=    0.8959     PROPCL=    0.2515   PROPCD=    0.0118    THPR= 2825.3489
THPAP = 2826.0222     THPAQ= 3507.4780    INTMPA= 3335.3682    PWRCL= 3335.3672
RC    =  920.7468     SFC   =    0.3901    FF=     1301.1270
```

DESIGN POINT NUMBER 11

FUEL FLOWS AND SPEEDS

GWI

LB.
46219
36975
27731
18488

	VHCL	RCH	FFHCL
46219	0	0	0
36975	0	0	0
27731	0	0	0
18488	0	0	0

	1		2		3		4	
	V1	HCR	V1	HCR	V1	HCR	V1	HCR
46219	0	0	0	0	0	0	0	0
36975	0	0	0	0	0	0	0	0
27731	0	0	0	0	0	0	0	0
18488	0	0	0	0	0	0	0	0

	1		1		2		1		2	
	V3	ACL	FFI	V3	ACL	FFI	V3	ACL	FFI	V3	ACL	FFI
46219	150	1167	1741	150	1167	1741	161	1078	1695	161	1078	1695
36975	133	1952	1747	133	1952	1747	143	1879	1701	143	1879	1701
27731	112	3176	1754	112	3176	1754	121	3120	1707	121	3120	1707
18488	78	5444	1761	78	5444	1761	87	5413	1713	87	5413	1713

	3			3		4				2	
	V3	ACL	FFI	V3	ACL	FFI	V3	ACL	FFI	V3	ACL	FFI
46219	174	975	1654	174	975	1654	189	666	1514	189	666	1514
36975	155	1791	1659	155	1791	1659	169	1413	1500	169	1413	1500
27731	132	3052	1665	132	3052	1665	144	2549	1487	144	2549	1487
18488	97	5371	1673	97	5371	1673	111	4619	1474	111	4619	1474

	5			2		
	V3	ACL	FFI	V3	ACL	FFI
46219	206	228	1318	206	228	1318
36975	184	921	1301	184	921	1301
27731	158	1955	1285	158	1955	1285
18488	125X	3813	1270	125	3813	1270

	1		2		3		4		5		6	
	V2	ACR	V2	ACR	V2	ACR	V2	ACR	V2	ACR	V2	ACR
46219	0	0	230	1385	0	0	206	1147	240	1475	0	0
36975	0	0	211	1099	0	0	234	1080	251	1462	0	0
27731	0	0	195	885	0	0	214	807	260	1484	0	0
18488	0	0	181	721	0	0	190	586	266	1502	0	0

	7		8		9	
	V2	ACR	V2	ACR	V2	ACR
	206	1190	162	1090	155	1088
	244	1146	145	864	138	884
	264	1171	125	682	120	703
	270	1145	102	506	98	526

DESIGN POINT NUMBER 11

SEGMENT	MODE	WP	H	V	D	T	W	FR
(21 SEGMENTS)	(START)	8620	0	0	0	0.000	36975	0
1	WUP	8620	0	0	0	0.017	36955	20
2	TOF	8620	0	0	0	0.033	36925	50
3	ALO	8620	0	138	0	0.050	36911	64
4	ACL	8620	20000	177	33	0.258	36583	392
5	ACR	8620	20000	234	171	0.848	35953	1022
6	ACR	8620	20000	234	172	0.853	35948	1027
7	DSC	8620	10000	234	188	0.919	35927	1048
8	ACR	8620	10000	209	189	0.924	35922	1053
9	DSC	8620	2000	209	200	0.977	35905	1070
10	ALO	8620	2000	136	200	1.002	35883	1092
11	DSC	8620	1000	136	200	1.019	35877	1098
12	DSC	8620	0	136	200	1.040	35866	1109
13	GND	8620	0	0	200	1.056	35846	1129
14	ACR	8620	20000	234	228	1.091	35696	1279
15	DSC	8620	5000	234	248	1.174	35670	1305
16	ALO	8620	5000	142?	248	1.507	35392	1583
17	DSC	8620	2000	142	250	1.524	35388	1587
18	ALO	8620	2000	135	250	1.549	35367	1608
19	DSC	8620	1000	135	250	1.566	35360	1615
20	DSC	8620	0	135	250	1.587	35350	1625
21	WUP	8620	0	0	250	1.603	35330	1645

MISSION FUEL, INCLUDING RESERVES, IS: 1645
FUEL RESERVES AT MAX. ENDURANCE CONDITION

END OF MISSION
DESIGN GROSS WEIGHT =   36975   , FUEL REQUIRED =   1645   , FUEL AVAILABLE =   1652
ENTER 1 FOR WT. EST. PARAMETERS, OR 2 TO REPEAT ACE801 & MSJD04:
```
   2.0542E+00    7.2678E+01    1.4668E+03    2.6933E+00    2.2262E+01    3.5701E+00    1.6965E+02    1.3169E+02
   2.4791E+01    3.1892E+01    2.6253E+02    4.1411E+01    3.0304E+01    1.1057E-01    1.9396E+02    2.3425E+02
   1.6452E+03    5.2821E+02    1.0000E+01    1.0565E+00    1.0565E+00    2.0003E+02    1.1866E-01    4.9775E+00
   3.6858E+00    1.4572E+01    3.7707E+01    3.8915E+01    1.0000E+00    4.0000E+00    2.2192E+03    2.6561E+04
   4.7111E+02    2.4090E+03    4.5267E+00    7.9898E+03    3.4159E+00    1.8259E+04    2.4477E+03    1.5220E+02
   3.0956E+00    2.0000E+04    1.1289E+03    5.5132E+00    2.8495E-01    7.0016E-01    1.2836E+00    0.0000E+00
   0.0000E+00    8.6200E+03    2.0000E+00
```
TRY DGW= 36968
ENTER 1, TO TRY ANOTHER DGW; 0 TO QUIT:
ENTER 1 FOR PRINTOUT ANYWAY, 2 TO INCLUDE COST, ANYTHING ELSE TO QUIT:

DESIGN POINT NUMBER 11

COST CHARACTERISTICS
1974 DOLLARS

BASIC AIRCRAFT DATA
DESIGN GROSS WEIGHT, LBS	36975
WEIGHT EMPTY, LBS	26561
ROTOR DIAMETER, FT	33.06
RATED POWER PER ENGINE (IRP SLS), SHP	1311
DISC LOADING, PSF	16.15
WING LOADING, PSF	70.00
POWER LOADING, LB/HP	7.05

COST FACTORS
DEPRECIATION PERIOD, YRS	12
UTILIZATION, BHR/YR	2500
ENGINE TBO, BHR	4500
DYNAMIC SYSTEMS TBO, BHR	3000
MAINTENANCE LABOR RATE, $/MHR	6.00
MAINTENANCE BURDEN, (RATIO OF DIRECT LABOR)	1.50
INSURANCE RATE, % AIRCRAFT INITIAL COST	2.00
FLIGHT CREW COST (TOTAL), $/BHR	136.48
FUEL COST RATE, $/LB	0.020
PRODUCTION QUANTITY	300

AIRCRAFT COMPONENT COSTS
AIRFRAME, $(M)	1.625
DYNAMIC SYSTEMS, $(M)	0.538
ENGINES, $(M)	0.314
AVIONICS, $(M)	0.250
RDTE/UNIT, $(M)	0.000
SPARES, $(M)	0.390
TOTAL INITIAL (EA.), $(M)	3.117

DIRECT OPERATING COST BREAKDOWN
DEPRECIATION, $/BHR	103.90
MAINTENANCE PARTS, $/BHR	39.81
MAINTENANCE LABOR, $/BHR	119.66
INSURANCE, $/BHR	21.82
CREW, $/BHR	136.48
FUEL, $/BHR	23.15
OTHER, $/BHR	0.00

SUMMARY
DIRECT OPERATING COST, $/BLOCK-HR	444.81
DIRECT OPERATING COST, $/TON-NMI	0.58
DIRECT OPERATING COST, CENTS/ASSM	4.54

DESIGN POINT NUMBER 1:

GROUP WEIGHT STATEMENT

ROTOR GROUP		2219 LBS
WING GROUP		2620
TAIL GROUP		385
HORIZONTAL	227	
VERTICAL	158	
BODY GROUP		4955
LANDING GEAR		1481
NOSE	365	
MAIN	1094	
AUXILIARY	22	
FLIGHT CONTROLS GROUP		2758
NONROTATING	2161	
ROTATING	307	
CONVERSION SYSTEM	290	
ENGINE SECTION		441
PROPULSION GROUP		4896
ENGINE INSTALLATION	1319	
EXHAUST SYSTEM	76	
LUBRICATION SYSTEM	194	
FUEL SYSTEM	165	
ENGINE CONTROLS	205	
STARTING SYSTEM	105	
DRIVE SYSTEM	2832	
GEARBOXES	2409	
SHAFTING	423	
INSTRUMENT GROUP		293
HYDRAULIC GROUP		325
ELECTRICAL GROUP		495
AVIONICS GROUP		458
FURNISHINGS AND EQUIPMENT GROUP		3526
ENVIRONMENTAL CONTROL GROUP		1371
AUXILIARY POWER UNIT		338
OTHER		0
LOAD HANDLING GROUP		0
WEIGHT EMPTY		26561 LBS

TO SEE ALL NASAWT VARIABLES ENTER 1; ELSE 0:

MISSION WEIGHT SUMMARY

WEIGHT EMPTY	26561 LBS
CREW	520
PAYLOAD	8100
AUXILIARY TANK	0
TRAPPED FLUIDS	142
FUEL AVAILABLE	1652
MISSION GROSS WEIGHT	36975
DESIGN GROSS WEIGHT	36975 LBS

WING STRUCTURAL DATA

BASIC DIMENSIONS
    SPAN BETWEEN ROTOR CENTERS, IN   569.656
    BOX MAXIMUM THICKNESS, %MAC   23.000
    FRONT SPAR LOCATION, %MAC   10.000
    AFT SPAR LOCATION, %MAC   55.000
    SPOILER LENGTH, IN   607.000
    FLAP LENGTH, IN   607.000

TORSIONAL CHARACTERISTICS
    DESIGN PYLON PITCH INERTIA, SLUG-FT2   3855.270
    DESIGN SHEAR MODULUS, PSI   4500000.000
    AREA OF BOX CROSS SECTION, FT2   4.653
    PERIMETER OF BOX SECTION, FT   8.831
    POLAR INERTIA OF BOX, IN4   2726.663
    WING TORSIONAL SPRING RATE, FT-LB/RAD   3338587.000

BENDING CHARACTERISTICS
    DESIGN VERTICAL THRUST AT EACH TIP, LBS   19925.891
    RESULTING JUMP TAKEOFF MOMENT, IN-LBS   3850480.000
    DESIGN NORMAL FORCE IN AIRPLANE, LBS   46218.750
    RESULTING ROOT MOMENT IN AIPLANE, IN-LBS   4202351.000
    DESIGN ROOT BENDING STRESS, PSI   50000.000
    BENDING INERTIA OF BOX, IN4   927.254

DETAIL DIMENSIONS
    SPAR AND BOX PANEL SKIN THICKNESS, IN   0.161
        (INNER + OUTER SKINS)
    TOTAL BOX PANEL THICKNESS, IN   1.038
        (INCLUDES CORE THICKNESS)
    DENSITY OF BOX SKINS, LBS/CU IN   0.078
    FUEL CAPACITY PER 100 INCHES CELL SPAN, LBS   1480.521

WING WEIGHT BREAKDOWN
    PRIMARY STRUCTURE, LBS   1342.122
    SECONDARY STRUCTURE, LBS   185.101
    FLAPERONS, LBS   0.000
    FLAPS AND SPOILERS, LBS   804.427
    WING FOLD FEATURE, LBS   0.000
    OUTER PANEL PRIMARY STRUCTURE, LBS   165.591
    OUTER PANEL SECONDARY STRUCTURE, LBS   122.999

    WING DESIGN GOVERNED BY: ABENDING
ENTER 1 FOR AIRCRAFT DATA REPORT, 0 TO SKIP:
 1

BELL HELICOPTER COMPANY
DESIGN SYNTHESIS PROGRAM

DESIGN POINT NUMBER II

PAGE 12
DATE 06/12/75

AIRCRAFT DATA

```
AIRCRAFT CHARACTERISTICS-
   AVAILABLE PASSENGER SEATS                                45.000
   MAXIMUM GROSS WEIGHT, LB                              36975.000
   DESIGN GROSS WEIGHT, LB                               36975.000
   WEIGHT EMPTY, LB                                      26561.000
   LIMIT FLIGHT LOAD FACTOR,  G                              2.500
   OVERALL DIMENSIONS (ROTORS TURNING)-
      HELICOPTER MODE:
         LENGTH, FT                                         77.750
         WIDTH, FT                                          81.081
         HEIGHT, FT                                         26.178
         DISTANCE BETWEEN ROTOR CENTERS,  FT                48.018
      AIRPLANE MODE:
         LENGTH, FT                                         77.750
         WIDTH, FT                                          80.534
         HEIGHT, FT                                         25.455
         DISTANCE BETWEEN ROTOR CENTERS,  FT                47.471
   NEUTRAL CENTER OF GRAVITY LOCATION-
   . STOL MODE:  MAST 60 DEGREES
         STATION LINE, IN                                  440.881
         BUTTOCK LINE, IN                                    0.000
         WATER LINE, IN                                    171.289
      AIRPLANE MODE:
         STATION LINE, IN                                  439.977
         BUTTOCK LINE, IN                                    0.000
         WATER LINE, IN                                    166.888
   MOMENT OF INERTIA-
      HELICOPTER MODE:
         PITCH, SLG-FT2                                  139984.875
         ROLL, SLG-FT2                                   255953.813
         YAW, SLG-FT2                                    394921.938
         CROSS(R-Y), SLG-FT2                               3620.138
      AIRPLANE MODE:
         PITCH, SLG-FT2                                  130029.500
         ROLL, SLG-FT2                                   244316.625
         YAW, SLG-FT2                                    401573.250
         CROSS(R-Y), SLG-FT2                               2190.183
   GROUND LOCATION-
      WATER LINE, IN                                        12.603

ROTOR CHARACTERISTICS-
   HUB TYPE                                                  GIMBAL
   BLADE TYPE                                         STIFF-INPLANE
   DIRECTION OF ROTATION (INBOARD TIP MOTION):
      HELICOPTER/AIRPLANE                                   AFT/UP
   NUMBER OF BLADES                                          3.000
   DISC LOADING AT DST, LB/FT2                              16.150
   BLADE LOADING COEFF. (CT/SIGMA) AT DST SL 90F             0.124
   ROTOR SPEED-
      HELICOPTER MODE:
         TIP SPEED, FT/SEC                                 700.000
         RPM                                               404.350
      AIRPLANE MODE:
         TIP SPEED, FT/SEC                                 600.000
         RPM                                               346.586
   SOLIDITY                                                  0.119
   DISC AREA PER ROTOR, FT2                                856.565
   ROTOR DIAMETER, FT                                       33.063
   BLADE CHORD, IN                                          24.651
   BLADE TWIST(EFFECTIVE), DEG                              44.100
   DELTA THREE, DEG                                        -15.000
   BLADE FLAPPING INERTIA, SLG-FT2                         444.351
   FLAPPING SPRING RATE, FT-LB/DEG                         572.203
   LONG. AND LAT. FLAPPING RESTRAINT, FT-LB/DEG            858.305
   PRECONE ANGLE, DEG                                       2.500
   BLADE INPLANE EFFECTIVE MASS, LBS                       117.885
   BLADE INPLANE MOMENT OF INERTIA, SLG-FT2                141.323
   DIST FROM VIRTUAL HINGE TO BLADE CG, FT                   5.290
   DIST FROM VIRTUAL HINGE TO MAST CENTER, FT                5.264
   RAD. OF GYRATION ABOUT BLADE CG, FT                       3.306

DRIVE SYSTEM-
   ENGINE TO TILT ROTOR GEAR RATIO                          45.156
```

DESIGN POINT NUMBER 11

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  ENGINE TO INTERCONNECT GEAR RATIO                            2.029
  INTERCONNECT TO ROTOR GEAR RATIO                            22.258
  RATED TORQUE OF ROTOR SHAFT, FT-LB                       50809.648
  RATED TORQUE OF INTERCONNECT SHAFT,  FT-LB                1466.761
  RATED TORQUE OF ENGINE DRIVE SHAFT, FT-LB                  471.113
  DRIVE SYSTEM INERTIA AT ROTOR SHAFT, SLG-FT2              3374.123
```

POWER PLANT-
```
  NUMBER OF ENGINES                                            4.000
  INTERMEDIATE RATED POWER(TOTAL-SLS), HP                   5243.160
  POWER LOADING AT DGW, LB/HP                                  7.052
  EMERGENCY POWER RATING(PER ENGINE-SL, 90F), HP            1346.443
  ENGINE TORQUE AT EMERGENCY RATING, FT-LB                   387.142
  MAX. CONT. POWER RATING(PER ENGINE-SLS), HP               1196.751
```

POD CHARACTERISTICS-
```
  CONVERSION PIVOT LOCATION:
    STATION LINE, IN                                         422.840
    BUTTOCK LINE, IN                                         284.828
    WATER LINE, IN                                           200.000
  DISTANCE BETWEEN PIVOT AND HUB CENTER,  IN                  75.161
  POD LENGTH AHEAD OF PIVOT,  IN                             126.739
  POD LENGTH AFT OF PIVOT,  IN                               101.000
  POD WIDTH,  IN                                              45.500
  POD HEIGHT,  IN                                             54.320
  POD WEIGHT (EACH),  LBS                                   3994.922
  DISTANCE FROM PIVOT TO POD CG,  IN                          20.804
```

WING-
```
  WING LOADING AT DGW, LB/FT2                                 70.000
  WING AREA, FT2                                             528.214
  FLAP AREA(TOTAL), FT2                                      143.379
  SPOILER  AREA(TOTAL), FT2                                   55.146
  WING SPAN, FT                                               72.678
  WING MEAN AERODYNAMIC CHORD:
    CHORD, FT                                                  7.268
    STATION LINE(1/4 MAC), IN                               439.977
    BUTTOCK LINE(1/4 MAC), IN                               204.865
    WATER LINE(1/4 MAC), IN                                 192.386
    LEADING EDGE STATION, IN                                418.174
    TRAILING EDGE STATION, IN                               505.387
  ASPECT RATIO                                               10.000
  TAPER RATIO                                                 1.370
  SWEEP, DEG                                                  0.000
  DIHEDRAL, DEG.                                              2.000
  INCIDENCE, DEG                                              4.000
  AIRFOIL THICKNESS, % MAC                                   23.000
  MAXIMUM THICKNESS LOCATION, % MAC                          40.000
  FRONT SPAR STATION AT FUSELAGE,  IN                       426.896
  AFT SPAR STATION AT FUSELAGE,  IN                         474.864
```

TAIL-
```
  HORIZONTAL:
    VOLUME COEFFICIENT                                        1.639
    ASPECT RATIO                                              3.745
    HORIZONTAL TAIL ARM, FT                                  37.090
    AREA, FT2                                               169.646
    SPAN, FT                                                 25.026
    MEAN AERODYNAMIC CHORD, FT                                6.730
    1/4 MAC STATION LINE, IN                                885.060
    1/4 MAC BUTTOCK LINE, IN                                 75.617
    1/4 MAC WATER LINE, IN                                  203.968
    SWEEP(MAX THICKNESS), DEG                                 0.000
    ELEVATOR AREA, FT2                                       50.894
  VERTICAL:
    NUMBER OF FINS                                            2.000
    VOLUME COEFFICIENT                                        0.130
    ASPECT RATIO(EACH)                                        2.440
    VERTICAL TAIL ARM, FT                                    37.895
    AREA(TOTAL), FT2                                        131.694
    SPAN(EACH), FT                                           12.677
    MEAN AERODYNAMIC CHORD, FT                                5.194
    1/4 MAC STATION LINE, IN                                894.726
    1/4 MAC BUTTOCK LINE, IN                                151.234
    1/4 MAC WATER LINE, IN                                  234.814
    SWEEP(UPPER PANEL, MAX THICKNESS), DEG                   13.656
    RUDDER AREA, FT2                                         38.505
```

DESIGN POINT NUMBER 11

FUSELAGE-
MOST FORWARD STATION LINE, IN   30.000
MOST AFT STATION LINE, IN   945.000
TOP STRINGER WATER LINE, IN   192.603
BOTTOM STRINGER WATER LINE, IN   42.603
MAX WIDTH BUTTOCK LINE, IN   75.000
LENGTH, FT   76.250
WIDTH, FT   12.500
HEIGHT, FT   12.500

LANDING GEAR-
ULTIMATE LANDING LOAD FACTOR, G   5.250
LANDING SPEED, KNOTS   80.000
NOSE(TURN CENTER GROUND LEVEL):
STATION LINE, IN   80.000
MAIN(EFFECTIVE CENTER GROUND LEVEL):
STATION LINE, IN   508.569
BUTTOCK LINE, IN   109.923
TAIL BUMPER
STATION LINE, IN   900.000
WATER LINE, IN   117.487

ANALYSIS COMPLETED FOR PT NO 11

ENTER OPTION TO READ NEW ARRAYS:
1,

ENTER 0 TO SKIP DESIGN DATA AND GO DIRECTLY TO TECHNOLOGY DATA:

45 PAX
2 ENG

D313-099-002

BELL HELICOPTER COMPANY
DESIGN SYNTHESIS PROGRAM

DESIGN POINT NUMBER 15
DGW = 36360

COMPONENT ZERO-LIFT DRAG, AIRPLANE, FLAPS UP

WING	HOR	VERT	FUS	NAC	BOOMS	EXT	MISC	TOTAL
3.97	1.32	1.03	7.02	2.28	0.00	2.00	0.00	17.61

DRAG WITH LIFT, AIRPLANE, FLAPS UP

ALPHA	CL	CD	CLWP	CLH	CLPRP	CDWP	CDF	CDH
-4.00000	-0.18513	0.04379	-0.07022	-0.11186	-0.00306	0.01305	0.01953	0.00496
-2.00000	0.02210	0.03919	0.10532	-0.08186	-0.00137	0.01328	0.01575	0.00392
0.00000	0.22901	0.03969	0.28086	-0.05186	0.00000	0.01575	0.01449	0.00320
2.00000	0.43613	0.04528	0.45640	-0.02186	0.00158	0.02048	0.01575	0.00281
4.00000	0.64400	0.05596	0.63194	0.00814	0.00391	0.02745	0.01953	0.00273
6.00000	0.85316	0.07173	0.80748	0.03814	0.00754	0.03667	0.02583	0.00298
8.00000	1.06417	0.09260	0.98302	0.06814	0.01301	0.04815	0.03466	0.00355
10.00000	1.27760	0.11856	1.15856	0.09814	0.02091	0.06187	0.04600	0.00445
12.00000	1.49404	0.14961	1.33409	0.12814	0.03180	0.07784	0.05987	0.00566
14.00000	1.71409	0.18576	1.50963	0.15815	0.04632	0.09606	0.07626	0.00720

SPEED POWER DATA-AIRPLANE

GW	=	36360	ALT=	0	TEMP=	59	OMGR=	600

V	=	139.0	159.0	179.0	199.0	219.0	239.0	259.0	279.0	299.0	319.0
ALPHA	=	8.768	6.215	4.450	3.184	2.246	1.532	0.976	0.536	0.180	-0.110

DESIGN POINT NUMBER 15

CL =	1.146	0.876	0.691	0.559	0.462	0.388	0.330	0.284	0.248	0.218
CD =	0.1020	0.0737	0.0591	0.0510	0.0463	0.0435	0.0418	0.0407	0.0400	0.0395
F =	50.0	36.0	28.7	24.8	22.5	21.1	20.3	19.7	19.4	19.2
PROPCL=	0.0975	0.0882	0.0858	0.0877	0.0924	0.0992	0.1073	0.1163	0.1260	0.1363
PROPCD=	0.0099	0.0104	0.0109	0.0113	0.0116	0.0119	0.0122	0.0125	0.0130	0.0134
PROPN =	79.5	78.1	77.6	77.7	78.2	78.9	79.7	80.3	80.7	81.0
PWREQD=	1858	2033	2333	2760	3318	4014	4856	5863	7060	8443
UTLHP =	4081									
NORMPW=	5604	5654	5708	5766	5823	5880	5943	6017	6107	6214
L/D =	8.3	8.7	8.6	8.0	7.4	6.6	6.0	5.3	4.7	4.2
SFC =	0.5546	0.5317	0.5002	0.4697	0.4456	0.4238	0.4097	0.4006	0.3940	0.3907
FF =	1030	1081	1167	1297	1478	1701	1989	2349	2782	3298

VMC=0 LIMITED
VMCX = 239.0
FF = 1700.5

SPEED POWER DATA-AIRPLANE
GW = 45450   ALT= 5000   TEMP= 41   OMGR= 540

V =	167.4	187.4	207.4	227.4	247.4	267.4	287.4	307.4	327.4
ALPHA =	8.768	6.582	4.983	3.780	2.853	2.126	1.544	1.071	0.682
CL =	1.146	0.914	0.747	0.621	0.525	0.449	0.389	0.340	0.300
CD =	0.1020	0.0773	0.0631	0.0545	0.0492	0.0458	0.0436	0.0420	0.0410
F =	50.0	37.7	30.7	26.5	23.9	22.2	21.1	20.4	19.9
PROPCL=	0.1590	0.1435	0.1366	0.1353	0.1379	0.1432	0.1505	0.1591	0.1687
PROPCD=	0.0110	0.0114	0.0118	0.0121	0.0123	0.0125	0.0128	0.0134	0.0144
PROPN =	86.?	84.8	83.8	83.2	83.0	83.1	83.1	82.9	82.3
PWREQD=	2581	2774	3097	3547	4127	4844	5716	6770	8038
UTLHP =	3673								
NORMPW=	5006	5059	5114	5169	5227	5293	5369	5458	5558
L/D =	9.0	9.4	9.3	8.9	8.4	7.7	7.0	6.3	5.7
SFC =	0.4535	0.4448	0.4325	0.4213	0.4144	0.4090	0.4055	0.4048	0.4056
FF =	1170	1234	1339	1494	1710	1981	2318	2741	3260

SPEED POWER DATA-AIRPLANE
GW = 36360   ALT= 5000   TEMP= 41   OMGR= 540

V =	149.8	169.8	189.8	209.8	229.8	249.8	269.8	289.8	309.8	329.8
ALPHA =	8.768	6.367	4.668	3.425	2.489	1.767	1.200	0.745	0.375	0.071
CL =	1.146	0.892	0.714	0.584	0.487	0.412	0.353	0.306	0.268	0.236
CD =	0.1020	0.0752	0.0607	0.0524	0.0474	0.0444	0.0424	0.0412	0.0403	0.0398
F =	50.0	36.7	29.5	25.4	23.0	21.5	20.6	20.0	19.6	19.3
PROPCL=	0.1324	0.1192	0.1144	0.1151	0.1193	0.1259	0.1342	0.1438	0.1542	0.1652
PROPCD=	0.0105	0.0109	0.0114	0.0118	0.0121	0.0123	0.0125	0.0128	0.0134	0.0144
PROPN =	84.1	82.7	81.8	81.4	81.4	81.8	82.2	82.4	82.3	81.9
PWREQD=	1891	2055	2334	2730	3245	3883	4655	5580	6686	8003
UTLHP =	3673									
NORMPW=	4963	5012	5065	5120	5175	5234	5301	5379	5469	5570
L/D =	8.8	9.2	9.1	8.6	7.9	7.2	6.5	5.8	5.2	4.6
SFC =	0.4963	0.4805	0.4612	0.4439	0.4267	0.4155	0.4098	0.4051	0.4044	0.4050
FF =	939	987	1076	1212	1385	1614	1908	2261	2704	3241

SPEED POWER DATA-AIRPLANE
GW = 27270   ALT= 5000   TEMP= 41   OMGR= 540

V =	129.7	149.7	169.7	189.7	209.7	229.7	249.7	269.7	289.7	309.7	329.7
ALPHA =	8.768	6.006	4.243	2.959	2.021	1.317	0.774	0.348	0.007	-0.271	-0.499
CL =	1.146	0.860	0.669	0.536	0.438	0.365	0.309	0.265	0.230	0.201	0.177
CD =	0.1020	0.0723	0.0576	0.0498	0.0454	0.0428	0.0412	0.0403	0.0397	0.0393	0.0391
F =	50.0	35.3	28.0	24.2	22.0	20.8	20.0	19.5	19.2	19.1	19.0
PROPCL=	0.1038	0.0933	0.0910	0.0936	0.0995	0.1075	0.1170	0.1274	0.1386	0.1502	0.1622
PROPCD=	0.0099	0.0104	0.0109	0.0114	0.0117	0.0120	0.0123	0.0125	0.0128	0.0134	0.0144
PROPN =	80.7	79.3	78.7	78.8	79.2	79.9	80.7	81.4	81.9	82.0	81.6
PWREQD=	1281	1414	1647	1982	2426	2981	3653	4456	5408	6538	7877
UTLHP =	3673										
NORMPW=	4918	4963	5012	5065	5120	5175	5234	5301	5379	5469	5569
L/D =	8.5	8.9	8.6	8.0	7.2	6.4	5.7	5.1	4.5	4.0	3.5
SFC =	0.5801	0.5554	0.5212	0.4845	0.4551	0.4339	0.4180	0.4107	0.4051	0.4042	0.4045
FF =	743	785	858	961	1104	1293	1527	1830	2191	2643	3186

SPEED POWER DATA-AIRPLANE
GW = 18180   ALT= 5000   TEMP= 41   OMGR= 540

V =	105.9	125.9	145.9	165.9	185.9	205.9	225.9	245.9	265.9	285.9	305.9	325.9
ALPHA =	8.768	5.595	3.613	2.297	1.380	0.716	0.230	-0.159	-0.457	-0.694	-0.886	-1.044
CL =	1.146	0.811	0.604	0.467	0.372	0.303	0.252	0.213	0.182	0.157	0.137	0.121
CD =	0.1020	0.0681	0.0535	0.0465	0.0430	0.0411	0.0401	0.0395	0.0391	0.0389	0.0388	0.0388
F =	50.0	33.2	26.0	22.6	20.9	19.9	19.4	19.1	19.0	18.9	18.8	18.8
PROPCL=	0.0726	0.0654	0.0658	0.0707	0.0783	0.0877	0.0982	0.1095	0.1213	0.1335	0.1459	0.1586
PROPCD=	0.0092	0.0098	0.0103	0.0108	0.0113	0.0117	0.0120	0.0122	0.0124	0.0127	0.0132	0.0142
PROPN =	74.0	72.8	73.2	74.3	75.8	77.2	78.6	79.8	80.8	81.6	81.8	81.6

DESIGN POINT NUMBER 15

PWREQD=	760	861	1044	1313	1673	2133	2698	3376	4178	5122	6236	7554
UTLHP =	3673											
NORMPW=	4871	4910	4954	5002	5055	5110	5164	5223	5287	5363	5451	5550
L/D =	7.8	8.2	7.8	7.0	6.2	5.4	4.7	4.1	3.6	3.1	2.7	2.4
SFC =	0.7257	0.6850	0.6286	0.5705	0.5162	0.4712	0.4433	0.4226	0.4124	0.4060	0.4039	0.4040
FF =	552	590	657	749	864	1005	1196	1427	1723	2079	2519	3052

SPEED POWER DATA-AIRPLANE
GW = 45450 ALT= 2000 TEMP= 52 OMGR= 540

V =	160.1	180.1	200.1	220.1	240.1	260.1	280.1	300.1	320.1
ALPHA =	8.768	6.497	4.857	3.637	2.706	1.980	1.404	0.938	0.556
CL =	1.146	0.905	0.733	0.606	0.509	0.434	0.374	0.326	0.287
CD =	0.1020	0.0764	0.0621	0.0536	0.0485	0.0452	0.0431	0.0417	0.0407
F =	50.0	37.3	30.2	26.1	23.5	21.9	20.9	20.2	19.7
PROPCL=	0.1478	0.1332	0.1272	0.1267	0.1300	0.1359	0.1436	0.1526	0.1625
PROPCD=	0.0107	0.0112	0.0116	0.0119	0.0122	0.0124	0.0126	0.0130	0.0138
PROPN =	85.4	84.0	83.1	82.6	82.4	82.6	82.8	82.8	82.5
PWREQD=	2489	2686	3018	3486	4091	4840	5745	6832	8133
UTLHP =	3673								
NORMPW=	5302	5354	5409	5464	5520	5581	5653	5739	5839
L/D =	9.0	9.4	9.2	8.8	8.2	7.5	6.8	6.1	5.5
SFC =	0.4707	0.4604	0.4471	0.4322	0.4200	0.4138	0.4083	0.4064	0.4063
FF =	1172	1236	1349	1507	1718	2002	2346	2777	3305

SPEED POWER DATA-AIRPLANE
GW = 36360 ALT= 2000 TEMP= 52 OMGR= 540

V =	143.2	163.2	183.2	203.2	223.2	243.2	263.2	283.2	303.2	323.2
ALPHA =	8.768	6.276	4.537	3.280	2.342	1.625	1.064	0.618	0.256	-0.040
CL =	1.146	0.882	0.700	0.569	0.472	0.397	0.339	0.293	0.256	0.225
CD =	0.1020	0.0743	0.0597	0.0515	0.0467	0.0438	0.0420	0.0409	0.0401	0.0396
F =	50.0	36.2	29.0	25.0	22.7	21.3	20.4	19.8	19.5	19.2
PROPCL=	0.1226	0.1105	0.1065	0.1078	0.1126	0.1197	0.1284	0.1383	0.1489	0.1602
PROPCD=	0.0103	0.0108	0.0112	0.0116	0.0119	0.0122	0.0124	0.0126	0.0131	0.0139
PROPN =	83.2	81.7	80.9	80.7	80.8	81.2	81.7	82.2	82.3	82.1
PWREQD=	1829	1996	2284	2695	3232	3901	4709	5674	6820	8183
UTLHP =	3673									
NORMPW=	5262	5310	5363	5418	5472	5529	5592	5665	5754	5855
L/D =	8.7	9.1	8.9	8.4	7.7	7.0	6.2	5.6	5.0	4.4
SFC =	0.5262	0.5076	0.4816	0.4577	0.4389	0.4222	0.4140	0.4081	0.4060	0.4060
FF =	962	1013	1100	1234	1419	1647	1950	2316	2769	3322

SPEED POWER DATA-AIRPLANE
GW = 27270 ALT= 2000 TEMP= 52 OMGR= 540

V =	124.0	144.0	164.0	184.0	204.0	224.0	244.0	264.0	284.0	304.0	324.0
ALPHA =	8.768	5.966	4.106	2.812	1.877	1.180	0.646	0.230	-0.102	-0.371	-0.591
CL =	1.146	0.850	0.655	0.520	0.423	0.351	0.296	0.253	0.218	0.191	0.168
CD =	0.1020	0.0714	0.0567	0.0490	0.0448	0.0424	0.0409	0.0401	0.0395	0.0392	0.0390
F =	50.0	34.8	27.5	23.8	21.7	20.5	19.8	19.4	19.2	19.0	18.8
PROPCL=	0.0960	0.0863	0.0846	0.0879	0.0942	0.1026	0.1123	0.1230	0.1343	0.1461	0.1582
PROPCD=	0.0098	0.0103	0.0108	0.0112	0.0116	0.0119	0.0122	0.0124	0.0126	0.0131	0.0139
PROPN =	79.4	78.0	77.6	77.9	78.5	79.3	80.2	81.1	81.7	82.0	81.9
PWREQD=	1244	1380	1622	1971	2433	3015	3722	4567	5565	6744	8139
UTLHP =	3673										
NORMPW=	5220	5264	5312	5365	5420	5475	5531	5594	5669	5758	5859
L/D =	8.3	8.7	8.5	7.8	7.0	6.2	5.5	4.8	4.3	3.8	3.3
SFC =	0.6155	0.5881	0.5494	0.5080	0.4700	0.4448	0.4251	0.4146	0.4084	0.4058	0.4058
FF =	766	812	891	1001	1144	1341	1582	1893	2273	2737	3302

SPEED POWER DATA-AIRPLANE
GW = 18180 ALT= 2000 TEMP= 52 OMGR= 540

V =	101.2	121.2	141.2	161.2	181.2	201.2	221.2	241.2	261.2	281.2	301.2	321.2
ALPHA =	8.768	5.483	3.469	2.150	1.242	0.589	0.106	-0.263	-0.550	-0.778	-0.963	-1.114
CL =	1.146	0.799	0.589	0.452	0.358	0.290	0.240	0.202	0.172	0.148	0.129	0.114
CD =	0.1020	0.0672	0.0526	0.0459	0.0426	0.0408	0.0399	0.0393	0.0390	0.0389	0.0388	0.0388
F =	50.0	32.7	25.6	22.3	20.6	19.8	19.3	19.1	18.9	18.9	18.8	18.8
PROPCL=	0.0670	0.0604	0.0613	0.0666	0.0745	0.0840	0.0947	0.1061	0.1181	0.1304	0.1429	0.1555
PROPCD=	0.0091	0.0097	0.0102	0.0107	0.0112	0.0116	0.0119	0.0121	0.0123	0.0126	0.0130	0.0138
PROPN =	72.2	71.1	71.8	73.3	75.0	76.7	78.1	79.4	80.6	81.4	81.9	81.9
PWREQD=	745	849	1039	1319	1697	2179	2775	3491	4340	5338	6510	7891
UTLHP =	3673											
NORMPW=	5177	5214	5257	5305	5357	5412	5467	5523	5585	5658	5745	5845
L/D =	7.6	8.0	7.6	6.8	6.0	5.2	4.4	3.9	3.4	2.9	2.6	2.3
SFC =	0.7700	0.7229	0.6601	0.5967	0.5379	0.4876	0.4528	0.4302	0.4163	0.4097	0.4058	0.4056
FF =	574	614	686	787	913	1063	1256	1502	1807	2187	2642	3201

SPEED POWER DATA-AIRPLANE
GW = 45450 ALT= 10000 TEMP= 23 OMGR= 600

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V =	180.9	200.9	220.9	240.9	260.9	280.9	300.9	320.9				
ALPHA =	8.768	6.721	5.192	4.020	3.105	2.377	1.788	1.305				
CL =	1.146	0.929	0.768	0.646	0.551	0.475	0.414	0.364				
CD =	0.1020	0.0787	0.0647	0.0561	0.0505	0.0469	0.0444	0.0428				
F =	50.0	38.4	31.5	27.3	24.5	22.8	21.6	20.7				
PROPCL=	0.1519	0.1380	0.1314	0.1296	0.1313	0.1355	0.1414	0.1487				
PROPCD=	0.0111	0.0114	0.0118	0.0121	0.0125	0.0130	0.0134	0.0150				
PROPN =	85.4	84.2	83.3	82.7	82.3	81.9	81.8	80.6				
PWREQD=	2812	3001	3310	3740	4299	4994	5824	6896				
UTLHP =	4081											
NORMPW=	4649	4706	4764	4826	4894	4971	5057	5151				
L/D =	9.0	9.3	9.3	9.0	8.5	7.8	7.2	6.5				
SFC =	0.4238	0.4172	0.4098	0.4032	0.3954	0.3909	0.3872	0.3851				
FF =	1192	1252	1357	1508	1700	1952	2255	2656				

SPEED POWER DATA-AIRPLANE
GW = 36360   ALT= 10000   TEMP= 23   OMGR= 600

V =	161.8	181.8	201.8	221.8	241.8	261.8	281.8	301.8	321.8			
ALPHA =	8.768	6.518	4.887	3.671	2.741	2.015	1.437	0.969	0.586			
CL =	1.146	0.908	0.737	0.610	0.513	0.438	0.378	0.329	0.290			
CD =	0.1020	0.0766	0.0623	0.0539	0.0486	0.0453	0.0432	0.0418	0.0408			
F =	50.0	37.4	30.3	26.2	23.6	22.0	20.9	20.2	19.8			
PROPCL=	0.1263	0.1145	0.1098	0.1098	0.1129	0.1183	0.1253	0.1334	0.1424			
PROPCD=	0.0106	0.0110	0.0114	0.0117	0.0121	0.0125	0.0129	0.0134	0.0150			
PROPN =	83.3	82.0	81.2	80.8	80.7	80.8	80.8	81.0	79.9			
PWREQD=	2064	2224	2491	2866	3354	3963	4703	5576	6691			
UTLHP =	4081											
NORMPW=	4598	4652	4708	4767	4829	4897	4974	5061	5156			
L/D =	8.7	9.1	9.0	8.6	8.0	7.4	6.7	6.0	5.4			
SFC =	0.4602	0.4497	0.4339	0.4186	0.4075	0.3987	0.3915	0.3874	0.3846			
FF =	950	1000	1081	1200	1367	1580	1841	2160	2573			

SPEED POWER DATA-AIRPLANE
GW = 27270   ALT= 10000   TEMP= 23   OMGR= 600

V =	140.1	160.1	180.1	200.1	220.1	240.1	260.1	280.1	300.1	320.1	340.1	
ALPHA =	8.768	6.231	4.474	3.210	2.272	1.557	1.000	0.558	0.201	-0.092	-0.334	
CL =	1.146	0.877	0.693	0.562	0.464	0.390	0.332	0.287	0.250	0.220	0.194	
CD =	0.1020	0.0739	0.0592	0.0511	0.0464	0.0436	0.0418	0.0407	0.0400	0.0396	0.0393	
F =	50.0	36.0	28.8	24.8	22.5	21.1	20.3	19.7	19.4	19.2	19.0	
PROPCL=	0.0988	0.0894	0.0669	0.0887	0.0934	0.1001	0.1081	0.1171	0.1268	0.1370	0.1476	
PROPCD=	0.0100	0.0105	0.0109	0.0113	0.0116	0.0120	0.0124	0.0129	0.0133	0.0147	0.0177	
PROPN =	79.6	78.3	77.8	77.9	78.3	78.9	79.5	79.9	80.4	79.6	77.4	
PWREQD=	1402	1533	1756	2073	2489	3009	3644	4407	5295	6408	7852	
UTLHP =	4081											
NORMPW=	4545	4594	4647	4704	4762	4824	4891	4967	5053	5147	5249	
L/D =	8.4	8.7	8.6	8.1	7.4	6.7	6.0	5.3	4.7	4.2	3.6	
SFC =	0.5298	0.5084	0.4810	0.4558	0.4324	0.4138	0.4025	0.3928	0.3882	0.3845	0.3861	
FF =	743	779	845	945	1076	1245	1467	1731	2055	2464	3032	

SPEED POWER DATA-AIRPLANE
GW = 18180   ALT= 10000   TEMP= 23   OMGR= 600

V =	114.4	134.4	154.4	174.4	194.4	214.4	234.4	254.4	274.4	294.4	314.4	334.4
ALPHA =	8.768	5.781	3.857	2.549	1.621	0.940	0.425	0.026	-0.288	-0.541	-0.747	-0.917
CL =	1.146	0.830	0.629	0.493	0.397	0.326	0.273	0.232	0.199	0.173	0.152	0.134
CD =	0.1020	0.0698	0.0550	0.0477	0.0438	0.0417	0.0404	0.0397	0.0393	0.0391	0.0389	0.0388
F =	50.0	34.0	26.7	23.1	21.3	20.2	19.6	19.3	19.1	18.9	18.9	18.8
PROPCL=	0.0691	0.0625	0.0624	0.0662	0.0725	0.0805	0.0895	0.0993	0.1097	0.1205	0.1315	0.1427
PROPCD=	0.0092	0.0098	0.0103	0.0108	0.0112	0.0115	0.0119	0.0122	0.0127	0.0131	0.0140	0.0166
PROPN =	72.6	71.5	71.8	72.9	74.4	75.9	77.2	78.4	79.1	79.9	79.8	78.0
PWREQD=	837	936	1112	1366	1703	2130	2653	3284	4036	4907	5959	7324
UTLHP =	4081											
NORMPW=	4490	4532	4580	4632	4687	4745	4806	4871	4945	5028	5120	5219
L/D =	7.6	8.0	7.7	7.1	6.4	5.6	4.9	4.3	3.8	3.3	2.9	2.5
SFC =	0.6787	0.6404	0.5873	0.5331	0.4847	0.4512	0.4244	0.4075	0.3966	0.3896	0.3853	0.3845
FF =	568	600	653	728	826	961	1126	1338	1601	1912	2296	2816

SPEED POWER DATA-AIRPLANE
GW = 45450   ALT= 20000   TEMP= -12   OMGR= 600

V =	213.0	233.0	253.0	273.0	293.0	313.0	
ALPHA =	8.768	6.992	5.609	4.513	3.651	2.911	
CL =	1.146	0.958	0.812	0.698	0.606	0.531	
CD =	0.1020	0.0814	0.0683	0.0595	0.0536	0.0495	
F =	50.0	39.8	33.2	28.9	26.0	24.0	
PROPCL=	0.1971	0.1799	0.1701	0.1654	0.1646	0.1665	
PROPCD=	0.0120	0.0125	0.0130	0.0134	0.0149	0.0179	
PROPN =	87.6	86.3	85.2	84.3	82.6	79.7	
PWREQD=	3227	3411	3700	4089	4640	5414	

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```
UTLHP  =    4081
NORMPW=    3695     3756     3821     3890     3963     4040
L/D    =     9.2      9.5      9.5      9.3      8.8      8.1
SFC    =   0.3916   0.3897   0.3871   0.3847   0.3831   0.3858
FF     =    1264     1329     1432     1573     1778     2089
```

SPEED POWER DATA-AIRPLANE
```
GW     =   36360     ALT=   20000    TEMP=     -12    OMGR=      600
V      =   190.5    210.5    230.5    250.5    270.5    290.5    310.5    330.5
ALPHA  =   8.768    6.811    5.328    4.179    3.273    2.546    1.954    1.466
CL     =   1.146    0.938    0.783    0.663    0.568    0.493    0.431    0.381
CD     =  0.1020   0.0796   0.0659   0.0572   0.0515   0.0477   0.0451   0.0433
F      =    50.0     38.9     32.1     27.8     25.0     23.1     21.9     21.0
PROPCL=   0.1652   0.1503   0.1427   0.1401   0.1410   0.1445   0.1499   0.1567
PROPCD=   0.0114   0.0118   0.0122   0.0128   0.0132   0.0143   0.0170   0.0217
PROPN  =    86.2     84.9     83.8     82.9     82.5     81.4     78.9     75.0
PWREQD=    2348     2498     2742     3082     3513     4081     4856     5915
UTLHP  =    4081
NORMPW=    3632     3688     3748     3812     3881     3953     4030     4111
L/D    =     9.1      9.4      9.4      9.1      8.6      7.9      7.1      6.2
SFC    =   0.4067   0.4021   0.3957   0.3902   0.3864   0.3825   0.3814   0.3892
FF     =     955     1004     1085     1203     1357     1561     1852     2302
```

SPEED POWER DATA-AIRPLANE
```
GW     =   27270     ALT=   20000    TEMP=     -12    OMGR=      600
V      =   165.0    185.0    205.0    225.0    245.0    265.0    285.0    305.0    325.0
ALPHA  =   8.768    6.555    4.942    3.733    2.805    2.078    1.498    1.027    0.641
CL     =   1.146    0.911    0.742    0.616    0.520    0.444    0.384    0.335    0.295
CD     =  0.1020   0.0776   0.0628   0.0542   0.0490   0.0456   0.0434   0.0419   0.0409
F      =    50.0     37.6     30.9     26.4     23.8     22.1     21.0     20.3     19.8
PROPCL=   0.1305   0.1184   0.1133   0.1130   0.1159   0.1211   0.1279   0.1359   0.1447
PROPCD=   0.0107   0.0111   0.0115   0.0119   0.0125   0.0129   0.0137   0.0158   0.0196
PROPN  =    83.6     82.4     81.5     80.9     80.6     80.6     80.3     78.6     75.5
PWREQD=    1572     1690     1889     2169     2538     2988     3550     4294     5276
UTLHP  =    4081
NORMPW=    3568     3618     3672     3731     3794     3861     3933     4009     4088
L/D    =     8.8      9.2      9.1      8.7      8.1      7.4      6.7      5.9      5.2
SFC    =   0.4416   0.4308   0.4184   0.4078   0.3982   0.3896   0.3846   0.3805   0.3822
FF     =     694      728      790      885     1011     1164     1365     1634     2016
```

SPEED POWER DATA-AIRPLANE
```
GW     =   18180     ALT=   20000    TEMP=     -12    OMGR=      600
V      =   134.7    154.7    174.7    194.7    214.7    234.7    254.7    274.7    294.7    314.7    334.7
ALPHA  =   8.768    6.148    4.357    3.082    2.144    1.434    0.884    0.450    0.101   -0.184   -0.419
CL     =   1.146    0.869    0.681    0.548    0.451    0.377    0.321    0.276    0.239    0.210    0.186
CD     =  0.1020   0.0731   0.0584   0.0504   0.0459   0.0432   0.0415   0.0405   0.0398   0.0394   0.0392
F      =    50.0     35.6     28.4     24.5     22.3     20.9     20.1     19.6     19.3     19.1     19.0
PROPCL=   0.0923   0.0835   0.0815   0.0837   0.0888   0.0958   0.1040   0.1132   0.1231   0.1334   0.1441
PROPCD=   0.0099   0.0104   0.0108   0.0112   0.0116   0.0121   0.0126   0.0130   0.0144   0.0171   0.0223
PROPN  =    78.4     77.1     76.7     76.9     77.5     78.1     78.6     79.2     78.7     76.7     72.7
PWREQD=     913     1002     1155     1374     1664     2030     2477     3006     3677     4544     5727
UTLHP  =    4081
NORMPW=    3500     3544     3592     3644     3700     3761     3826     3896     3969     4047     4128
L/D    =     8.2      8.6      8.4      7.9      7.2      6.5      5.7      5.1      4.5      3.9      3.3
SFC    =   0.5340   0.5113   0.4826   0.4555   0.4298   0.4106   0.3983   0.3885   0.3828   0.3793   0.3855
FF     =     487      512      558      626      715      833      986     1168     1408     1724     2208
```

CLIMB DATA-AIRPLANE, DGW
```
GW     =36360.0000      ALT=    0.0000    TEMP=   59.0000    OMGR=  600.0000
V      =  139.0133     VGND=  137.7900   ALPHA=    8.4616  ALPHAC=    7.6065
PROPNL=     0.7948       CL=    1.1132      CD=    0.0981     DCD=    0.1517
PROPNC=     0.8865    PROPCL=    0.2386   PROPCD=    0.0106    THPR= 3418.8271
THPAP = 5133.4375    THPAQ= 3421.3684   INTMPA= 6122.9692   PWRCL= 4080.8774
RC     = 1863.4438      SFC =    0.4324      FF= 1764.6318
```

CLIMB DATA-AIRPLANE, DGW
```
GW     =36360.0000      ALT=    0.0000    TEMP=   59.0000    OMGR=  600.0000
V      =  139.0133     VGND=  137.7900   ALPHA=    8.4616  ALPHAC=    7.6065
PROPNL=     0.7948       CL=    1.1132      CD=    0.0981     DCD=    0.1517
PROPNC=     0.8865    PROPCL=    0.2386   PROPCD=    0.0106    THPR= 3418.8271
THPAP = 5133.4375    THPAQ= 3421.3684   INTMPA= 6122.9692   PWRCL= 4080.8774
RC     = 1863.4438      SFC =    0.4324      FF= 1764.6318
```

CLIMB DATA-AIRPLANE, DGW
```
GW     =36360.0000      ALT= 5000.0000    TEMP=   41.1710    OMGR=  600.0000
V      =  149.7703     VGND=  148.7325   ALPHA=    8.5045  ALPHAC=    6.7487
PROPNL=     0.8148       CL=    1.1178      CD=    0.0987     DCD=    0.1347
```

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```
PROPNC=    0.8919   PROPCL=    0.2534   PROPCD=    0.0111   THPR= 3440.6125
THPAP = 4657.4609   THPAQ= 3442.4336   INTMPA= 5521.2515   PWRCL= 4080.8779
RC    = 1782.3538   SFC   =    0.4172   FF=      1702.3818
```

CLIMB DATA-AIRPLANE, DGW
```
GW    =36360.0000     ALT= 5000.0000   TEMP=    41.1710   OMGR=   600.0000
V     =  149.7703   VGND=  148.7325   ALPHA=    8.5045   ALPHAC=    6.7487
PROPNL=    0.8148     CL=    1.1178   CD=       0.0987   DCD=       0.1347
PROPNC=    0.8919   PROPCL=    0.2534   PROPCD=    0.0111   THPR= 3440.6125
THPAP = 4657.4609   THPAQ= 3442.4336   INTMPA= 5521.2515   PWRCL= 4080.8779
RC    = 1782.3538   SFC   =    0.4172   FF=      1702.3818
```

CLIMB DATA-AIRPLANE, DGW
```
GW    =36360.0000     ALT=10000.0000   TEMP=    23.3420   OMGR=   600.0000
V     =  161.7962   VGND=  160.9368   ALPHA=    8.5446   ALPHAC=    5.9080
PROPNL=    0.8325     CL=    1.1220   CD=       0.0992   DCD=       0.1179
PROPNC=    0.8965   PROPCL=    0.2688   PROPCD=    0.0116   THPR= 3458.9417
THPAP = 4184.6484   THPAQ= 3460.2180   INTMPA= 4935.2524   PWRCL= 4080.8779
RC    = 1686.5137   SFC   =    0.4055   FF=      1654.7397
```

CLIMB DATA-AIRPLANE, DGW
```
GW    =36360.0000     ALT=10000.0000   TEMP=    23.3420   OMGR=   600.0000
V     =  161.7962   VGND=  160.9368   ALPHA=    8.5446   ALPHAC=    5.9080
PROPNL=    0.8325     CL=    1.1220   CD=       0.0992   DCD=       0.1179
PROPNC=    0.8965   PROPCL=    0.2688   PROPCD=    0.0116   THPR= 3458.9417
THPAP = 4184.6484   THPAQ= 3460.2180   INTMPA= 4935.2524   PWRCL= 4080.8779
RC    = 1686.5137   SFC   =    0.4055   FF=      1654.7397
```

CLIMB DATA-AIRPLANE, DGW
```
GW    =36360.0000     ALT=15000.0000   TEMP=     5.5130   OMGR=   600.0000
V     =  175.2964   VGND=  174.6043   ALPHA=    8.5816   ALPHAC=    5.0933
PROPNL=    0.8483     CL=    1.1260   CD=       0.0996   DCD=       0.1017
PROPNC=    0.9008   PROPCL=    0.2848   PROPCD=    0.0120   THPR= 3475.8689
THPAP = 3722.0764   THPAQ= 3476.7114   INTMPA= 4368.8813   PWRCL= 4080.8779
RC    = 1575.9819   SFC   =    0.3961   FF=      1616.3140
```

CLIMB DATA-AIRPLANE, DGW
```
GW    =36360.0000     ALT=15000.0000   TEMP=     5.5130   OMGR=   600.0000
V     =  175.2964   VGND=  174.6043   ALPHA=    8.5816   ALPHAC=    5.0933
PROPNL=    0.8483     CL=    1.1260   CD=       0.0996   DCD=       0.1017
PROPNC=    0.9008   PROPCL=    0.2848   PROPCD=    0.0120   THPR= 3475.8689
THPAP = 3722.0764   THPAQ= 3476.7114   INTMPA= 4368.8813   PWRCL= 4080.8779
RC    = 1575.9819   SFC   =    0.3961   FF=      1616.3140
```

CLIMB DATA-AIRPLANE, DGW
```
GW    =36360.0000     ALT=20000.0000   TEMP=   -12.3160   OMGR=   600.0000
V     =  190.5188   VGND=  190.1189   ALPHA=    8.6397   ALPHAC=    3.7133
PROPNL=    0.8619     CL=    1.1322   CD=       0.1003   DCD=       0.0742
PROPNC=    0.9018   PROPCL=    0.2827   PROPCD=    0.0123   THPR= 3275.5818
THPAP = 3276.1436   THPAQ= 3480.3347   INTMPA= 3841.4531   PWRCL= 3841.4526
RC    = 1249.5286   SFC   =    0.3896   FF=      1496.7627
```

CLIMB DATA-AIRPLANE, DGW
```
GW    =36360.0000     ALT=20000.0000   TEMP=   -12.3160   OMGR=   600.0000
V     =  190.5188   VGND=  190.1189   ALPHA=    8.6397   ALPHAC=    3.7133
PROPNL=    0.8619     CL=    1.1322   CD=       0.1003   DCD=       0.0742
PROPNC=    0.9018   PROPCL=    0.2627   PROPCD=    0.0123   THPR= 3275.5818
THPAP = 3276.1436   THPAQ= 3480.3347   INTMPA= 3841.4531   PWRCL= 3841.4526
RC    = 1249.5286   SFC   =    0.3896   FF=      1496.7627
```

DESIGN POINT NUMBER 15

FUEL FLOWS AND SPEEDS

GW1

LB.
45450
36360
27270
18180

	1	
VHCL	RCH	FFHCL
0	0	0
0	0	0
0	0	0
0	0	0

	1		2		3		4
	V1	HCR	V1	HCR	V1	HCR	V1	HCR
45450	0	0	0	0	0	0	0	0
36360	0.	0	0	0	0	0	0	0
27270	0	0	0	0	0	0	0	0
18180	0	0	0	0	0	0	0	0

	1		1		1		2
	V3	ACL	FF1	V3	ACL	FF1	V3	ACL	FF1	V3	ACL	FF1
45450	155	1062	1757	155	1062	1757	167	964	1695	167	964	1695
36360	138	1863	1765	138	1863	1765	149	1782	1702	149	1782	1702
27270	116	3112	1772	116	3112	1772	126	3048	1710	126	3048	1710
18180	82	5426	1780	82	5426	1780	92	5387	1718	92	5387	1718

	3		2		1		4		2
	V3	ACL	FF1	V3	ACL	FF1	V3	ACL	FF1	V3	ACL	FF1
45450	181	852	1649	181	852	1649	196	724	1610	196	724	1610
36360	161	1687	1655	161	1687	1655	175	1576	1616	175	1576	1616
27270	137	2972	1661	137	2972	1661	149	2879	1624	149	2879	1624
18180	102	5338	1668	102	5338	1668	113	5269	1632	113	5269	1632

	1		5		2
	V3	ACL	FF1	V3	ACL	FF1
45450	213	458	1518	213	458	1518
36360	190	1250	1497	190	1250	1497
27270	163	2437	1477	163	2437	1477
18100	127	4584	1459	127	4584	1459

	1		2		3		4		5		6
	V2	ACR	V2	ACR	V2	ACR	V2	ACR	V2	ACR	V2	ACR
45450	0	0	236	1463	0	0	228	1303	251	1598	0	0
36360	0	0	222	1199	0	0	246	1167	262	1580	0	0
27270	0	0	205	970	0	0	220	857	270	1593	0	0
18180	0	0	194	820	0	0	200	643	274	1601	0	0

7		8		9	
V2	ACR	V2	ACR	V2	ACR
228	1309	167	1170	160	1172
266	1315	150	939	143	962
280	1310	130	743	124	766
290	1342	106	552	101	574

DESIGN POINT NUMBER 15

SEGMENT (21 SEGMENTS)	MODE (START)	WP	H	V	D	T	W	FR
	(START)	8620	0	0	0	0.000	36360	0
1	WUP	8620	0	0	0	0.017	36337	23
2	TOF	8620	0	0	0	0.033	36303	57
3	ALD	8620	0	143	0	0.050	36287	73
4	ACL	8620	20000	183	32	0.249	35958	402
5	ACR	8620	20000	268	170	0.764	35282	1078
6	ACR	8620	20000	245	171	0.768	35277	1083
7	DSC	8620	10000	245	187	0.835	35254	1106
8	ACR	8620	10000	220	188	0.839	35249	1111
9	DSC	8620	2000	220	200	0.893	35230	1130
10	ALD	8620	2000	141	200	0.918	35207	1153
11	DSC	8620	1000	141	200	0.934	35199	1161
12	DSC	8620	0	141	200	0.955	35187	1173
13	GND	8620	0	0	200	0.972	35164	1196
14	ACR	8620	20000	245	227	0.998	35016	1344
15	DSC	8620	5000	245	248	1.081	34988	1372
16	ALD	8620	5000	147	248	1.414	34687	1673
17	DSC	8620	2000	147	250	1.431	34682	1678
18	ALD	8620	2000	140	250	1.456	34659	1701
19	DSC	8620	1000	140	250	1.472	34651	1709
20	DSC	8620	0	140	250	1.493	34639	1721
21	WUP	8620	0	0	250	1.510	34616	1744

MISSION FUEL, INCLUDING RESERVES, IS: 1744
FUEL RESERVES AT MAX. ENDURANCE CONDITION

END OF MISSION
DESIGN GROSS WEIGHT =   36360   . FUEL REQUIRED =   1744   . FUEL AVAILABLE =   1760
ENTER 1 FOR WT. EST. PARAMETERS, OR 2 TO REPEAT ACEB01 & MSJD04:

```
 2.0371E+00   6.9628E+01   3.3626E+03   2.6723E+00   2.2128E+01   3.5424E+00   1.4777E+02   1.1505E+0
 1.8467E+01   3.3597E+01   2.4941E+02   3.0848E+01   2.2574E+01   1.0320E-01   1.9349E+02   2.6872E+0
 1.7439E+03   4.8480E+02   1.0000E+01   9.7161E-01   9.7181E-01   2.0005E+02   1.1866E-01   4.9794E+0
 3.6489E+00   1.4573E+01   3.6060E+01   3.9167E+01   1.0000E+00   4.0000E+00   2.1751E+03   2.5837E+0
 1.1286E+03   2.5103E+03   4.7827E+00   7.6154E+03   3.6387E+00   1.7474E+04   2.4410E+03   1.5425E+0
 3.0698E+00   2.0000E+04   1.1963E+03   5.4671E+00   6.5328E-01   8.5461E-01   1.5668E+00   0.0000E+0
 0.0000E+00   8.6200E+03   2.0000E+00
```

TRY DGW= 36544
ENTER 1. TO TRY ANOTHER DGW; 0 TO QUIT:
ENTER 1 FOR PRINTOUT ANYWAY, 2 TO INCLUDE COST, ANYTHING ELSE TO QUIT:

DESIGN POINT NUMBER 15

COST CHARACTERISTICS
1974 DOLLARS

BASIC AIRCRAFT DATA
DESIGN GROSS WEIGHT, LBS	36360
WEIGHT EMPTY, LBS	25837
ROTOR DIAMETER, FT	32.79
RATED POWER PER ENGINE (IRP SLS), SHP	3005
DISC LOADING, PSF	16.15
WING LOADING, PSF	75.00
POWER LOADING, LB/HP	6.05

COST FACTORS
DEPRECIATION PERIOD, YRS	12
UTILIZATION, BHR/YR	2500
ENGINE TBO, BHR	4500
DYNAMIC SYSTEMS TBO, BHR	3000
MAINTENANCE LABOR RATE, $/MHR	6.00
MAINTENANCE BURDEN, (RATIO OF DIRECT LABOR)	1.50
INSURANCE RATE, % AIRCRAFT INITIAL COST	2.00
FLIGHT CREW COST (TOTAL), $/BHR	136.44
FUEL COST RATE, $/LB	0.100
PRODUCTION QUANTITY	300

AIRCRAFT COMPONENT COSTS
AIRFRAME, $(M)	1.574
DYNAMIC SYSTEMS,$(M)	0.548
ENGINES, $(M)	0.301
AVIONICS, $(M)	0.250
RDTE/UNIT, $(M)	0.000
SPARES, $(M)	0.383
TOTAL INITIAL (EA.), $(M)	3.057

DIRECT OPERATING COST BREAKDOWN
DEPRECIATION, $/BHR	101.90
MAINTENANCE PARTS, $/BHR	40.45
MAINTENANCE LABOR, $/BHR	104.88
INSURANCE, $/BHR	21.39
CREW, $/BHR	136.44
FUEL, $/BHR	133.35
OTHER, $/BHR	0.00

SUMMARY
DIRECT OPERATING COST, $/BLOCK-HR	538.41
DIRECT OPERATING COST, $/TON-NMI	0.65
DIRECT OPERATING COST, CENTS/ASSM	5.05

DESIGN POINT NUMBER 15

GROUP WEIGHT STATEMENT

ROTOR GROUP		2175 LBS
WING GROUP		2459
TAIL GROUP		345
HORIZONTAL	200	
VERTICAL	145	
BODY GROUP		4918
LANDING GEAR		1461
NOSE	361	
MAIN	1078	
AUXILIARY	22	
FLIGHT CONTROLS GROUP		2702
NONROTATING	2113	
ROTATING	303	
CONVERSION SYSTEM	286	
ENGINE SECTION		203
PROPULSION GROUP		4815
ENGINE INSTALLATION	1031	
EXHAUST SYSTEM	57	
LUBRICATION SYSTEM	306	
FUEL SYSTEM	167	
ENGINE CONTROLS	102	
STARTING SYSTEM	117	
DRIVE SYSTEM	3035	
GEARBOXES	2510	
SHAFTING	525	
INSTRUMENT GROUP		293
HYDRAULIC GROUP		325
ELECTRICAL GROUP		495
AVIONICS GROUP		458
FURNISHINGS AND EQUIPMENT GROUP		3479
ENVIRONMENTAL CONTROL GROUP		1371
AUXILIARY POWER UNIT		338
OTHER		0
LOAD HANDLING GROUP		0
WEIGHT EMPTY		25837 LBS

TO SEE ALL NASAWT VARIABLES ENTER 1; ELSE 0:

MISSION WEIGHT SUMMARY

WEIGHT EMPTY	25837 LBS
CREW	520
PAYLOAD	8100
AUXILIARY TANK	0
TRAPPED FLUIDS	143
FUEL AVAILABLE	1760
MISSION GROSS WEIGHT	36360
DESIGN GROSS WEIGHT	36360 LBS

DESIGN POINT NUMBER 15

WING STRUCTURAL DATA

BASIC DIMENSIONS
SPAN BETWEEN ROTOR CENTERS, IN   566.152
BOX MAXIMUM THICKNESS, %MAC   23.000
FRONT SPAR LOCATION, %MAC   10.000
AFT SPAR LOCATION, %MAC   55.000
SPOILER LENGTH, IN   587.000
FLAP LENGTH, IN   587.000

TORSIONAL CHARACTERISTICS
DESIGN PYLON PITCH INERTIA, SLUG-FT2   3531.840
DESIGN SHEAR MODULUS, PSI   4500000.000
AREA OF BOX CROSS SECTION, FT2   4.271
PERIMETER OF BOX SECTION, FT   8.460
POLAR INERTIA OF BOX, IN4   2457.718
WING TORSIONAL SPRING RATE, FT-LB/RAD   3027913.000

BENDING CHARACTERISTICS
DESIGN VERTICAL THRUST AT EACH TIP, LBS   19756.836
RESULTING JUMP TAKEOFF MOMENT, IN-LBS   3820394.000
DESIGN NORMAL FORCE IN AIRPLANE, LBS   45450.000
RESULTING ROOT MOMENT IN AIPLANE, IN-LBS   3815736.000
DESIGN ROOT BENDING STRESS, PSI   50000.000
BENDING INERTIA OF BOX, IN4   835.794

DETAIL DIMENSIONS
SPAR AND BOX PANEL SKIN THICKNESS, IN   0.165
  (INNER + OUTER SKINS)
TOTAL BOX PANEL THICKNESS, IN   0.994
  (INCLUDES CORE THICKNESS)
DENSITY OF BOX SKINS, LBS/CU IN   0.078
FUEL CAPACITY PER 100 INCHES CELL SPAN, LBS   1358.836

WING WEIGHT BREAKDOWN
PRIMARY STRUCTURE, LBS   1310.341
SECONDARY STRUCTURE, LBS   175.851
FLAPERONS, LBS   0.000
FLAPS AND SPOILERS, LBS   730.762
WING FOLD FEATURE, LBS   0.000
OUTER PANEL PRIMARY STRUCTURE, LBS   139.153
OUTER PANEL SECONDARY STRUCTURE, LBS   103.362

WING DESIGN GOVERNED BY: TORSION
ENTER 1 FOR AIRCRAFT DATA REPORT, 0 TO SKIP:
1

DESIGN POINT NUMBER 15

AIRCRAFT DATA

AIRCRAFT CHARACTERISTICS—
  AVAILABLE PASSENGER SEATS 45.000
  MAXIMUM GROSS WEIGHT, LB 36360.000
  DESIGN GROSS WEIGHT, LB 36360.000
  WEIGHT EMPTY, LB 25837.000
  LIMIT FLIGHT LOAD FACTOR, G 2.500
  OVERALL DIMENSIONS (ROTORS TURNING)—
    HELICOPTER MODE:
      LENGTH, FT 77.850
      WIDTH, FT 80.508
      HEIGHT, FT 26.053
      DISTANCE BETWEEN ROTOR CENTERS, FT 47.721
    AIRPLANE MODE:
      LENGTH, FT 77.850
      WIDTH, FT 79.966
      HEIGHT, FT 24.855
      DISTANCE BETWEEN ROTOR CENTERS, FT 47.179
  NEUTRAL CENTER OF GRAVITY LOCATION—
    STOL MODE: MAST 60 DEGREES
      STATION LINE, IN 440.120
      BUTTOCK LINE, IN 0.000
      WATER LINE, IN 171.581
    AIRPLANE MODE:
      STATION LINE, IN 439.258
      BUTTOCK LINE, IN 0.000
      WATER LINE, IN 167.725
  MOMENT OF INERTIA—
    HELICOPTER MODE:
      PITCH, SLG-FT2 .... 137656.563
      ROLL, SLG-FT2 .... 248545.125
      YAW, SLG-FT2 .... 386413.500
      CROSS(R-Y), SLG-FT2 .... 3542.955
    AIRPLANE MODE:
      PITCH, SLG-FT2 .... 127866.750
      ROLL, SLG-FT2 .... 237730.313
      YAW, SLG-FT2 .... 392921.500
      CROSS(R-Y), SLG-FT2 .... 2143.490
  GROUND LOCATION—
    WATER LINE, IN 13.085

ROTOR CHARACTERISTICS—
  HUB TYPE .... GIMBAL
  BLADE TYPE .... STIFF-INPLANE
  DIRECTION OF ROTATION (INBOARD TIP MOTION):
    HELICOPTER/AIRPLANE .... AFT/UP
  NUMBER OF BLADES 3.000
  DISC LOADING AT DST, LB/FT2 .... 16.150
  BLADE LOADING COEFF. (CT/SIGMA) AT DST SL 90 .... 0.124
  ROTOR SPEED—
    HELICOPTER MODE:
      TIP SPEED, FT/SEC 700.000
      RPM 407.755
    AIRPLANE MODE:
      TIP SPEED, FT/SEC 600.000
      RPM 349.504
  SOLIDITY 0.119
  DISC AREA PER ROTOR, FT2 .... 844.286
  ROTOR DIAMETER, FT 32.787
  BLADE CHORD, IN 24.445
  BLADE TWIST(EFFECTIVE), DEG 44.100
  DELTA THREE, DEG .... -15.000
  BLADE FLAPPING INERTIA, SLG-FT2 .... 428.289
  FLAPPING SPRING RATE, FT-LB/DEG 558.312
  LONG. AND LAT. FLAPPING RESTRAINT, FT-LB/DEG 837.468
  PRECONE ANGLE, DEG 2.500
  BLADE INPLANE EFFECTIVE MASS, LBS 115.545
  BLADE INPLANE MOMENT OF INERTIA, SLG-FT2 .... 136.215
  DIST FROM VIRTUAL HINGE TO BLADE CG, FT 5.246
  DIST FROM VIRTUAL HINGE TO MAST CENTER, FT 5.220
  RAD. OF GYRATION ABOUT BLADE CG, FT 3.279

DRIVE SYSTEM—
  ENGINE TO TILT ROTOR GEAR RATIO 42.863

DESIGN POINT NUMBER 15

```
ENGINE TO INTERCONNECT GEAR RATIO                           1.942
INTERCONNECT TO ROTOR GEAR RATIO                           22.072
RATED TORQUE OF ROTOR SHAFT, FT-LB                      49670.066
RATED TORQUE OF INTERCONNECT SHAFT, FT-LB               3362.648
RATED TORQUE OF ENGINE DRIVE SHAFT, FT-LB               1128.605
DRIVE SYSTEM INERTIA AT ROTOR SHAFT, SLG-FT2            3457.517
```

POWER PLANT-
```
NUMBER OF ENGINES                                           2.000
INTERMEDIATE RATED POWER(TOTAL-SLS), HP                  6010.148
POWER LOADING AT DGW, LB/HP                                 6.050
EMERGENCY POWER RATING(PER ENGINE-SL, 90F), HP          3086.811
ENGINE TORQUE AT EMERGENCY RATING, FT-LB                 927.443
MAX. CONT. POWER RATING(PER ENGINE-SLS), HP             2743.633
```

POD CHARACTERISTICS-
CONVERSION PIVOT LOCATION:
```
  STATION LINE, IN                                       422.840
  BUTTOCK LINE, IN                                       283.076
  WATER LINE, IN                                         200.000
DISTANCE BETWEEN PIVOT AND HUB CENTER, IN                 74.577
POD LENGTH AHEAD OF PIVOT, IN                            125.724
POD LENGTH AFT OF PIVOT, IN                               96.000
POD WIDTH, IN                                             36.837
POD HEIGHT, IN                                            57.393
POD WEIGHT (EACH), LBS                                  3807.711
DISTANCE FROM PIVOT TO POD CG, IN                         20.642
```

WING-
```
WING LOADING AT DGW, LB/FT2                                75.000
WING AREA, FT2                                           484.800
FLAP AREA(TOTAL), FT2                                    132.837
SPOILER AREA(TOTAL), FT2                                  51.091
WING SPAN, FT                                             69.628
WING MEAN AERODYNAMIC CHORD:
  CHORD, FT                                                6.963
  STATION LINE(1/4 MAC), IN                              439.258
  BUTTOCK LINE(1/4 MAC), IN                              196.266
  WATER LINE(1/4 MAC), IN                                192.706
  LEADING EDGE STATION, IN                               418.369
  TRAILING EDGE STATION, IN                              501.922
ASPECT RATIO                                              10.000
TAPER RATIO                                                1.000
SWEEP, DEG                                                 0.000
DIHEDRAL, DEG                                             2.000
INCIDENCE, DEG                                            4.000
AIRFOIL THICKNESS, % MAC                                 23.000
MAXIMUM THICKNESS LOCATION, % MAC                        40.000
FRONT SPAR STATION AT FUSELAGE, IN                       426.401
AFT SPAR STATION AT FUSELAGE, IN                         472.680
```

TAIL-
HORIZONTAL:
```
  VOLUME COEFFICIENT                                       1.639
  ASPECT RATIO                                             3.745
  HORIZONTAL TAIL ARM, FT                                 37.443
  AREA, FT2                                              147.765
  SPAN, FT                                                23.524
  MEAN AERODYNAMIC CHORD, FT                               6.281
  1/4 MAC STATION LINE, IN                               885.574
  1/4 MAC BUTTOCK LINE, IN                                70.572
  1/4 MAC WATER LINE, IN                                 203.934
  SWEEP(MAX THICKNESS), DEG                                0.000
  ELEVATOR AREA, FT2                                      44.330
VERTICAL:
  NUMBER OF FINS                                           2.000
  VOLUME COEFFICIENT                                       0.130
  ASPECT RATIO(EACH)                                       2.440
  VERTICAL TAIL ARM, FT                                   38.142
  AREA(TOTAL), FT2                                       115.051
  SPAN(EACH), FT                                          11.847
  MEAN AERODYNAMIC CHORD, FT                               4.855
  1/4 MAC STATION LINE, IN                               896.958
  1/4 MAC BUTTOCK LINE, IN                               141.144
  1/4 MAC WATER LINE, IN                                 232.621
  SWEEP(UPPER PANEL, MAX THICKNESS), DEG                  13.789
  RUDDER AREA, FT2                                        33.639
```

DESIGN POINT NUMBER 15

FUSELAGE-
  MOST FORWARD STATION LINE, IN   30.000
  MOST AFT STATION LINE, IN   945.000
  TOP STRINGER WATER LINE, IN   193.085
  BOTTOM STRINGER WATER LINE, IN   43.085
  MAX WIDTH BUTTOCK LINE, IN   75.000
  LENGTH, FT   76.250
  WIDTH, FT   12.500
  HEIGHT, FT   12.500

LANDING GEAR-
  ULTIMATE LANDING LOAD FACTOR, G   5.250
  LANDING SPEED, KNOTS   80.000
  NOSE(TURN CENTER GROUND LEVEL):
    STATION LINE, IN   80.000
  MAIN(EFFECTIVE CENTER GROUND LEVEL):
    STATION LINE, IN   508.563
    BUTTOCK LINE, IN   109.925
  TAIL BUMPER
    STATION LINE, IN   900.000
    WATER LINE, IN   117.970

ANALYSIS COMPLETED FOR PT NO 15

ENTER OPTION TO READ NEW ARRAYS:
1

ENTER 0 TO SKIP DESIGN DATA AND GO DIRECTLY TO TECHNOLOGY DATA: